Neal Smith
National Wildlife Refuge
Prairie City, Iowa
Fiscal Year 2004

Refuge Manager	Date	Refuge Supervisor	Date

Regional Chief, NWRS	Date

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INTRODUCTION

The tallgrass prairie. Wild, untamed, respected, admired, and feared by generations of our ancestors. Long before them, the ancestors of peoples native to this place for thousands of years survived on the bounty and blessings their prairie home provided them.

But our generation has no such memory of the prairie. The social, cultural, economic, ecological, and biological history of most of the 20th century did not include the tallgrass prairie. Fortunately for us, our children, and all who follow, we may indeed still get a chance to know the tallgrass prairie, or at least a small part of it. Hope arrived in the 1990's when Iowa Congressman Neal Smith and other concerned and learned citizens were in tune with the urgent need to recapture what by then had become one of the most endangered natural ecosystem on the planet. And they did something about it.

Their energy, foresight, and hard work led to the creation of Walnut Creek National Wildlife Refuge in 1990, and following that, the Prairie Learning Center, in 1996.

Establishment of the Refuge by the U. S. Fish and Wildlife Service was for the purposes of restoring native tallgrass prairie, wetland, and savanna habitats; serving as a major environmental education center providing opportunities for study; providing wildlife dependent outdoor recreation benefits to the public; and providing assistance to local landowners to improve their lands for wildlife habitat.

For future generations, the legacy of the political resolve exerted here will show itself in the rich diversity of wild plants and animals on this 8,654 acre prairie restoration and reconstruction project…one of the largest and most ambitious such undertakings of its kind the world has ever seen. The Refuge, renamed Neal Smith National Wildlife Refuge in 1998, is located in Jasper County, Iowa, on the southern Iowa drift plain, approximately 20 miles east of Des Moines. Urban and regional growth trends lead one to conclude that this still-rural piece of historic landscape will continue to see the positive and negative impacts that human activity brings upon it.

The Refuge staff understands that the continued stewardship and recovery of this prairie and the surrounding watershed is an unequivocal need. The story of the tallgrass prairie needs to be told again and again, for it is the intimacy of the experience which serves to create the stewardship. Compelling biological research projects and outreach programs, special public events, high-quality hunting opportunities, and outstanding environmental education and interpretive programs all bring the intimacy of the prairie to people's lives.

For the Refuge staff the mission is clear. The wisdom, vision and hard work of bringing a small part of the prairie back will continue unabated. We will keep the tallgrass prairie alive, relevant, and important to people in the 21st century.

HIGHLIGHTS FOR 2004

- Anabat technology reveals interesting information for bat surveys on Refuge (p 3)
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Monitoring and Studies

1.a. Surveys and Censuses

ROS Rich served on a detail almost the entire month of May as a member of the air crew performing breeding pair surveys in South and North Dakota.

Bird Point Counts at Neal Smith National Wildlife Refuge, Summer of 2004
Principal Investigator: Bret Geisler

This is the eleventh year of the bird counts at Neal Smith National Wildlife Refuge (NSNWR) near Prairie City, Iowa. Liessa Thomas began the bird counts as part of the work for her Master's Thesis in 1994. She reported that very little documentation existed quantifying the changes of avifauna over time on large-scale prairie restoration projects. The NSNWR is a large-scale prairie restoration area with hundreds of acres of primarily crop fields having been seeded with native tallgrass prairie plantings. A savanna area is being developed and for the most part, the remnant grass areas, woody areas, and riparian areas have been left undisturbed.

The methods used to do the counts were established during Liessa's thesis work and are listed in her thesis (Thomas et al). There have been a few modifications to the methods over the years. Up until and including the year 1999, three counts were done for each point. It was determined that very little was statistically gained by doing each count three times so currently each point is visited once.

An AOU code was created for unknown meadowlarks (UNME). When no birds were recorded at a point within the 10 minute recording time, the four character code NONE was entered and NA (not applicable) was entered under the "GUILD" field on the Excel database. Also a period or dot at the end of the AOU code on the data sheet means the birds were recorded in the second five minutes of the count or T2.

The counts were done between June 5 and July 13. The bison confinement counts were done June 22, 28 and 30. Only one count (point 40) in the bison confinement was shortened to six minutes as the result of approaching bison.

As a result of crop fields being seeded to prairie plants, crop field points have declined. Six new crop points were added this year to keep the number of crop points comparable to the other three habitat types of this project. The new crop points are 192, 193, 194, 195, 196, and 197. There were six crop points from last year that were either planted to prairie or left fallow and thus became herbaceous fields this year. Those six points are 53, 57, 134, 186, 188, and 189.

There were a total of 113 point counts with 59 species in 678 entered data records and 1098 individual birds being counted, compared to last year's 69 species and 1300 individuals. See the breakdown for all the species identified in the 2004 bird counts on Table 1.

2004 Breeding Bird Count Results – Table 1

COMMON NAME	SPECIES	POINTS OBS.	TOTAL #
Red-Winged Blackbird	RWBL	48	177
Common Yellowthroat	COYE	44	72
American Goldfinch	AMGO	39	68
Gray Catbird	GRCA	36	67
House Wren	HOWR	35	63
American Robin	AMRO	30	43
Brown-Headed Cowbird	BHCO	23	36
Song Sparrow	SOSP	25	36
Northern Cardinal	NOCA	25	32
Barn Swallow	BARS	19	30
Mourning Dove	MODO	19	27
Dickcissel	DICK	17	26
Killdeer	KILL	15	26
Indigo Bunting	INBU	17	21
Vesper Sparrow	VESP	15	21
Willow Flycatcher	WIFL	16	20
Cliff Swallow	CLSW	6	19
Rose-Breasted Grosbeak	RBGR	16	19
Bobolink	BOBO	3	17
Downy Woodpecker	DOWO	16	17
White-Breasted Nuthatch	WBNU	11	17
Red-Bellied Woodpecker	RBWO	12	16
Horned Lark	HOLA	9	15
Sedge Wren	SEWR	10	14
Eastern Kingbird	EAKI	12	13
Blue Jay	BLJA	9	12
Field Sparrow	FISP	10	12
Great-Crested Flycatcher	GCFL	8	12
Black-Capped Chickadee	BCCH	6	11
Eastern Bluebird	EABL	5	11
Northern Oriole	NOOR	11	11
Eastern Wood-Peewee	EAWP	9	10
Yellow Warbler	YWAR	10	10
Common Grackle	COGR	8	9
Hairy Woodpecker	HAWO	9	9
Brown Thrasher	BRTH	7	7
Eastern Meadowlark	EAME	7	7
Grasshopper Sparrow	GRSP	6	7
Henslow's Sparrow	HESP	5	7
Rufous-Sided Towhee	RSTO	7	7
Yellow-Billed Cuckoo	YBCU	6	6
Northern Flicker	NOFL	5	5
European Starling	EUST	2	3
House Finch	HOFI	3	3
Lark Sparrow	LASP	2	3
Red-Eyed Vireo	REVI	3	3
Unknown Meadowlark	UNME	3	3
Cerulean Warbler	CERW	2	2
Orchard Oriole	OROR	2	2
Red-Headed Woodpecker	RHWO	1	2
Ring-Necked Pheasant	RNPH	2	2
Tree Swallow	TRES	2	2
Bank Swallow	BANS	1	1
Great-Horned Owl	GHOW	1	1
Loggerhead Shrike	LOSH	1	1
Pileated Woodpecker	PIWO	1	1
Purple Martin	PUMA	1	1
Red-Tailed Hawk	RTHA	1	1
Western Meadowlark	WEME	1	1
Wood Thrush	WOTH	1	1

There were 23 crop points, 32 herbaceous points, 30 riparian points, and 28 wood points. Only two of the 113 points had no birds (NONE) recorded in the 10-minute period. These were points 103 herbaceous and 139 crop. Also, there were four instances where counts were discontinued due to the weather, three times because of rain and once because of high winds exceeding 12 mph.

The month of June was extremely wet which may have contributed to the fewer records. Groups of juvenile red-winged blackbirds didn't start showing up until very late June and early July. Last year, these large groups of fledged blackbirds were obvious by mid-June. The Henslow's sparrow (HESP) numbers were also down from last year, appearing on five points as opposed to last year's 10 points. The points were in the northern third of the Refuge with one point (point 40) from within the bison confinement. On the 13th of July, while walking out of a field near point 12, I observed two separate groups of fledged Henslow's sparrows. The first group was three fledglings with an adult and the second was two fledglings with an adult.

Upland sandpipers (UPSA), another grassland bird of special interest, were not recorded this year although individuals were identified in fields near Highway 163 while traveling between points.

Broods of ring-necked pheasants were small and much scarcer than last year. The heavy rains of late May and early June had an impact on their reproduction as well. However, several adult hens and roosters were observed and so one can expect the hens to make a second or even third attempt at laying another clutch.

There was one new species to have been recorded on the counts this year, the Pileated woodpecker (PIWO). Also notable is the increase in Eastern bluebirds (EABL) on the Refuge. Several broods were recorded or observed this summer. In the case of point 36, the fledglings were still sitting with both adults on the branch near the nesting cavity.

The wet weather was likely the main contributor to the decrease in bird numbers this year as opposed to last year's dry summer.

REFERENCE:

Thomas, Liessa H., E. E. Klaas. Breeding Birds of a Large-Scale Tallgrass Prairie Restoration in Iowa: Monitoring Abundance and Frequency of Occurrence. Master's Thesis, Iowa State University, Ames. 1999.

Anabat Survey Report

Principal Investigator: Kim Livengood

In early May 2004, one evening of active bat monitoring on the Neal Smith NWR was conducted using Anabat bat detectors. This limited survey of a savanna area revealed a species assemblage including Eastern Red bats *Lasiurus borealis*, Big Brown bats *Eptesicus fuscus* and many recordings of 40 kHz *Myotis*. In central Iowa, the endangered Indiana bat and the Little Brown bat are two *Myotis* species that are difficult to distinguish acoustically. For this reason, calls of these two species are sometimes grouped together and referred to as 40 kHz *Myotis* calls. According to surveys conducted in 1997 by the Refuge staff, reproductively active Indiana bats are known from the Neal Smith NWR (photo 1). This

survey used active monitoring which means that bat calls were recorded while observations of behavior were made visually. The combination of visual cues and acoustic records improves the chance of identifying bats such as these, which are hard to identify acoustically. A careful analysis of the recorded calls, in the context of the visual observations, led us to conclude that at least some of the 40 kHz *Myotis* we recorded were Indiana bats. Further acoustic recordings, and preferably trapping, would be necessary to confirm their presence.

The use of bat detectors in this brief survey illustrates the usefulness of this technology (photo 2). Bat detectors give land managers a cost effective tool to survey bats which are otherwise extremely labor intensive to monitor. They also allow managers to confirm the presence of a bat species without physical interference. This is particularly valuable in areas where maternity colonies are present since care must be taken not to disturb the roosts or stress the females.

Bat detectors can be used in a variety of ways. Active monitoring is the most effective method for species identification when conducted by a skilled observer. Using this method, observations of bat behavior can be used in conjunction with characteristics of recorded calls to identify a higher percent of calls and to increase the certainty of identification.

Passive monitoring is conducted by leaving bat detectors out in the field to automatically record and store bat calls. This method can be used to record for just a few hours, or all night, every night for years, depending on the objectives. Long-term passive recording has the advantage that the sampling effort can be vastly greater for much less human resource commitment than is possible using active monitoring. This increases the possibility of detecting rare or difficult-to-identify species by increasing the likelihood that distinctive calls from those species will be detected. In addition, the long term record can provide insights into spatial and temporal heterogeneity which are unattainable through other means. This approach is relatively new and there is a great deal yet to be learned about how to get the most out of passively recorded datasets, but the technology has proven effective and relatively inexpensive. If used appropriately, a small network of passive monitoring stations could provide useful baseline data and provide the means to assess the long-term impacts of land management decisions on bat faunas.

1.b. Studies and Investigations

Integrated Monitoring of Soils, Hydrology, and Vegetation Across a Landscape During Prairie Reconstruction.

Investigators: Cynthia Cambardella[1], Pauline Drobney[2], Keith Schilling[3], Mark Tomer[1], Peter Jacobson[4]

1- Soil Scientists, USDA/ARS NSTL, 2150 Pammel Dr. Ames IA
2- USDI/FWS NSNWR, Prairie City IA
3- IDNR/GSB, Iowa City IA
4- Dept of Biology, Grinnell College, Grinnell IA

This was the establishment year of a long-term project that will evaluate changes in soils and hydrology during the development of a community of native prairie vegetation. Current work is focused on linking landscape-scale C and hydrologic cycles to groundwater nitrate-N and DOC for a small (12 ha) hydrologic catchment area within a new prairie reconstruction site which was seeded in the fall of 2003. The area was surveyed with a differential GPS system to

obtain detailed topographic data, which were used to construct a 2-m digital elevation model of the site. Terrain analyses were performed to evaluate hydrologic flowpaths, slopes, and contributing areas across the site. This information was used to locate a series of 15 monitoring transects along hillslopes, plus two more across runoff drainageways. Neutron-probe access tubes were installed along these transects to allow repeated measurements of soil moisture. Runoff collectors were installed to document areas of runoff generation on the landscape. Suction cup lysimeters were installed at 2.4-m depth (above the watertable) to allow water samples to be collected from the unsaturated zone for analyses of nutrients, dissolved carbon, and other inorganic constituents. Initial measurements have been made of soil moisture, runoff, and soil water chemistry, although results are not yet available at the time of reporting.

In December 2003 (prior to grass seeding) and November 2004, we collected three soil cores from each sampling site for a total of 294 cores to a depth of 15 cm. The surface soil cores were sectioned into two depth increments (0-7.5 and 7.5-15 cm) and soil was composited by depth increment prior to processing for biological and chemical analysis. Measurements for each depth increment from the deep cores will include bulk density, field moisture content, total soil organic C, total soil inorganic C, and soil texture. The surface soil depth increments will be used for analysis of several forms of biologically-active soil C and stabilized soil C in addition to the measurements described for the deep cores. All soil samples will be catalogued and archived at the National Soils Tilth Lab for future experimental purposes.

Four plant monitoring transects were installed adjacent to soil sampling transects in 2004, following the Floristic Quality Assessment Technique (Wilhelm, 1999). Changes in native species diversity and conservatism, exotic species composition, and vegetative cover will be analyzed relative to soil and water characteristics through time.

Tim Weisbrod, a graduate student at the University of Iowa as part of his MS thesis project, conducted a natural gradient bromide tracer test and slug tests to estimate hydraulic conductivity (K) values at the Cabbage site. Six wells were installed in a linear transect along the southern waterway to facilitate tracer injection and monitoring (photo 3).

The final step of Tim's MS thesis will be to use the collected data to create a numerical groundwater model. The numerical model will be created using the Groundwater Modeling System (GMS) program, with use of the MODFLOW and MT3DMS codes. The basic geologic and hydrologic understanding established from core descriptions, tracer tests, and slug tests will be used to assign boundary conditions and layer properties at the Cabbage site. The calibrated model will be used to predict future water level changes and nitrate changes through time with varying land use (photo 4 and photo 5).

Results of this project will allow us to evaluate how prairie reconstruction effects, and is affected by, changes in soil quality and hydrologic conditions occurring during the transition from agricultural production to a reconstructed prairie. This information is of interest to a diverse group in the scientific community, particularly those with an interest in movement and cycling of water, nutrients, and carbon on the landscape and spatial patterns that are influenced by this movement and cycling. Results will also help USFWS staff evaluate long term effects of investments in prairie reconstruction at NSNWR.

Effects of Channel Incision on Riparian Zone Hydrology and Sedge Meadow Reconstruction

Principal Investigator: Keith E. Schilling, Iowa Geological Survey, Iowa City, IA and Pauline M. Drobney, Neal Smith National Wildlife Refuge, Prairie City, IA

Incised channels are common features in many agricultural watersheds with riparian zones often dominated by reed canary grass (*Phalaris arundinacea*) monocultures. We are exploring how channel incision has modified the water table configuration in the floodplain where we are converting a dense reed canary grass area to a moderately diverse sedge meadow at the Neal Smith National Wildlife Refuge. We designated one side of Walnut Creek for treatment and the other as a control and established plant and monitoring well transects to monitor changing hydrologic conditions relative to floristic composition. We observed that channel incision has lowered the water table from the stream edge to a distance of 30 m into the floodplain, resulting in a large unsaturated zone in the near-stream riparian zone. Continuous water level monitoring during high flow events indicated little interaction of surface water and ground water in a narrow streambank zone adjacent to the channel. Chemical monitoring during 2003 recharge events implied that significant nitrate mineralization had occurred in the unsaturated near-stream riparian zone. Burning, mowing and herbicide treatment during the growing season of 2002 and 2003 effectively removed most reed canary grass on the control side. We observed water tables on the untreated side as much as 1.2 m lower than the treated side due to the effects of plant transpiration (photo 6). In 2004 data from plant transects installed in the treatment area indicated marked increases in native species diversity and density compared to past years and to the control area. To a large degree, native plant species diversity and density expressed in 2004 was apparently due to propagules within the seed bank, though approximately 2,000 greenhouse grown plants were introduced in fall 2003 and spring 2004. In fall 2003 three areas approximately 10 feet in diameter were concentrated with fen plant plugs taken from an off-refuge area that was undergoing hydrologic repair. A diverse prairie seed mix was introduced in mid-summer 2004. While monitoring remains ongoing, study results identify the large role that incised streams play in modifying riparian zone hydrology that can subsequently impact ecological restoration in a riparian zone (photo 7).

Oak savanna research at Neal Smith National Wildlife Refuge: Hydrologic Response of Degraded Oak Savannas to Restoration Treatments

Principal Investigator: Heidi Asbjornsen, Iowa State University

Brief background: Research on savanna restoration was initiated at the Neal Smith National Wildlife Refuge in 2003 as a collaborative project with Iowa State University (see Research Summary submitted in 2003 for more detailed background information). The study includes two remnant savanna sites (approximately 15-20 ha each; "Birdhead" and "Old Game Farm") that are characterized by large, open-grown white oak and burr oak trees (indicative of former savanna habitat), which as a result of fire suppression have become overgrown with shade tolerant tree species (e.g., ironwood, elm, ash, dogwood). The primary objective of the research is to understand the changes in plant species composition and ecological functioning in response to the restoration treatments. In particular, we are interested in understanding how interactions between the trees and the understory herbaceous vegetation in restored and degraded savanna ecosystems regulate the cycling of water and nutrients through the system.

The results of this research will help inform future restoration work, both at the Refuge and at other sites in the Midwest.

Restoration treatments: Mechanical removal of all non-savanna tree species (i.e., everything except for white and bur oak) was conducted in the treatment area at "Old Game Farm" during the winter of 2003-4. Burning was scheduled to occur during the fall of 2004, but was postponed due to inadequate fuel availability.

Plant species composition: Plant species in the herbaceous layer were recorded within the treatment and control areas three times during the growing season (April, July, and September). Shrubs were sampled once during the growing season (July).

Hydrology: One groundwater well with a transducer was installed in the treatment and in the control site. Soil moisture access tubes were installed at four points surrounding six large oak trees (3/treatment) and every 20 m along the two main transects (displaced by 2 m from the center line). Soil moisture monitoring was initiated in August-September but then terminated in October due to a failure in the neutron probe equipment.

Plant water cycling: Plant transpiration was measured for dominant species in the understory of both the treated and control sites, as well as for corn and prairie plants in the adjacent crop field and reconstructed prairie, respectively. Sap flow equipment (thermal dissipation probes) was installed in six bur oak trees and four subdominant elm trees within the savanna restoration study site, and sap flow monitoring initiated in July.

Oak regeneration: To determine the effects of savanna restoration on oak regeneration, naturally occurring bur oak seedlings are monitored at the treatment and control sites savanna sites. In 2003 plots were established in two landscape positions: below bur oak tree canopy and in canopy gaps. This allowed us to determine where seedlings naturally most densely occur, as well as the importance of canopy gaps for their survival and growth. Work in 2004 involved remonitoring all seedlings identified in 2003 for height and basal diameter, as well as adding any newly established seedlings to the study.

Collaboration: Research collaborators on this project include Drs. Cindy Cambardella and Mark Tomer (USDA National Soil Tilth Lab), Dr. Keith Schilling (Geologic Survey Bureau, Iowa DNR) and Dr. Cathy Mabry (ISU, NREM). Two graduate students (Lars Brudvig, Ph.D. candidate, NREM/EEB, and Martin Gomez, Ph.D. candidate, NREM) are currently participating in this research. Two other graduate students also involved in this research completed their degrees in 2004 (Chris Evans, M.Sc., NREM and Holly Karnitz, M.Sc., NREM/EEB). Additionally, we are collaborating with the U.S. Forest Service on a project aimed at assessing ecological indicators used in the USFS Forest Inventory Analysis system.

Agroecosystem Restoration Research at Neal Smith National Wildlife Refuge: Integration of Water, Nutrient and Carbon Cycling Under Diverse Annual-perennial Plant Communities in Agricultural Landscapes
Principal Investigator: Heidi Asbjornsen, Iowa State University

Brief Background: This is a new project initiated in August 2004 with support from the U.S. Forest Service and the Leopold Center, focusing on understanding the effects of perennial vegetation on ecosystem structure and function in agricultural landscapes.

The first objective of this study is to quantify the influence of different proportions and landscape configurations of annual (e.g., corn and soybean) and perennial (e.g., prairie, savanna, agroforestry) plant communities on the storage, cycling, and output of nutrients, water, and carbon at the field and catchment scale. This objective will be achieved through field experimentation to examine the main hypothesis that strategic integration of perennial plant communities in agricultural landscapes will disproportionately improve nutrient, carbon and water fluxes—thereby reducing nutrient loads and movement of precipitation to surface waters and groundwater—while maintaining high productivity of the annual crop systems. The second major objective of this study is to catalyze change on the landscape by promoting greater understanding among diverse groups of people (i.e., the public, policy makers, farmers, environmentalists, etc.) that agroecosystem production and environmental stewardship are compatible when appropriate combinations and configurations of perennial and annual plants are established. A major component of addressing this objective will involve educational and outreach activities coordinated through the Neal Smith NWR Prairie Learning Center. Below is a summary of the field activities completed during the fall of 2004:

Site selection: Twelve small watersheds (ranging in size from 1 to 7 ha) were selected for the study. Six of the watersheds are currently under brome grass, and 6 were planted from brome to native prairie during the winter of 2004. Three sampling points were marked in each watershed: shoulder, midslope, and toe. Each watershed was geo-referenced using a Trimble GPS unit, and detailed topographical maps are currently under construction using ArcView.

Hydrologic monitoring: Two groundwater wells were established in each watershed (shoulder and toe positions). Soil moisture access tubes were installed (to 1 m depth) at the shoulder, midslope and toe positions in each watershed (for monitoring soil moisture using a neutron probe). Suction lysimeters will be installed in December 2004, also in all three watershed positions.

Soil sampling: Soil samples were collected from all watersheds and will be analyzed for nutrient content, soil organic matter, and physical properties this winter at the U.S. Forest Service's laboratory in Grand Rapids, Minnesota.

Collaboration: Researchers involved in this project and their respective institutions are as follows: *Iowa State University:* Rick Cruse, Matt Helmers, Matt Liebman, and Lisa Schulte. *The National Soil Tilth Lab*: Cindy Cambardella and Mark Tomer. *Iowa Geologic Survey/DNR*: Keith Schilling. U.S. Forest Service: Dave Lytle, Randy Kolka. New collaborators from *Iowa State University* who will likely participate in future research include: Cathy Kling, German Mora, Matt O'Neil, Jean Opsomer, and Silvia Secchi. Graduate students involved in the project include: Melissa Cheatham, Greg Shepherd, and Mario Perez-

Bidegain. In addition, Maged Nosshi has been working as a research associate on this project since August 2004, and will most likely continue until August of 2005.

Effects of grazing mammals on tallgrass prairie restorations
Principal Investigator: Brian Wilsey; Graduate Research Assistant: Leanne Martin, Department of Ecology, Evolution and Organismal Biology, Iowa State University, Ames, IA

The presence of bison and prescribed fire, as well as the relatively large size of the reconstructed prairie at Neal Smith National Wildlife Refuge makes it an excellent site to test hypotheses concerning prairie restoration success. Our research project at NSM has two primary objectives: 1) to identify whether various aspects of plant diversity and ecosystem functioning have been restored successfully, and 2) determine how bison grazing is impacting plant diversity and ecosystem functioning of restorations.

The first part of our project was designed to quantitatively compare plant diversity and net primary productivity (NPP) between prairie plantings at NSM and nearby remnants (reference prairies), and to collect time 0 data for the second part of our project (see below). Plots of 6 x 8 m were established within eight plantings at NSM and within three nearby reference prairies (Sheeder Prairie, Rolling Thunder Prairie and A.C. Morris Prairie, eight plots per remnant). Quadrats (0.4 m2) were clipped during 2002 and 2003 within each of the eight plantings and the three remnants. This gave us eight plots north of the visitor road (planted with prairie mix plus six lbs/acre of Canada wildrye) and eight to the south (planted with prairie mix only). Above ground material was sorted into live and dead components, and live biomass was sorted by species, dried and weighed. Mean plant species richness, evenness, and overall diversity, and the proportion of native and exotic species were calculated at the quadrat (plant neighborhood) scale. An estimate of proportion of beta diversity (amount of "patchiness") was made by comparing mean quadrat-level estimates to estimates for the entire site. Within NSM, species evenness and diversity was higher and species richness was similar in plantings north of the road, where a cover crop was used, than in plantings south of the road, where a cover crop was not used. There were large differences in quadrat-scale species richness and the proportion of beta diversity between NSM and remnants. However, there were no significant differences in species evenness. These results suggest that large differences remain in the number of species and the patchiness of species between the prairie plantings at NSM and remnants. Seed addition studies (part 2) are in progress to determine if diversity can be increased by adding seed (i.e. if it is limited by the availability of seed.

The second part of our project was designed to determine if bison grazing is affecting plant diversity, NPP, proportion of grass and exotic species, and seedling establishment. In June 2003, a bison exclosure (8 x 6 m) was built within each of the eight plantings at NSM. Within each planting, there are also two adjacent 8 x 6 m plots that were left open to bison activities. Seeds of ten rare plant species, including forbs, legumes, and grasses, were added to 1 x 1 m subplots within each of the plots in June 2003 and twenty-five species were added to an additional set of subplots in spring 2004 to repeat the experiment. Plots of the same size were established nearby to serve as controls for the seed addition. Seedlings were counted monthly in each of the plots for the remainder of the 2003 growing season (first seed addition) and in the 2004 growing season (first and second seed addition). Light availability and soil water were also measured to determine if grazing affects these variables that are so important to seedling establishment. Because the amount of grazing varies from site to site, and because

this variation is important in predicting responses, we also estimated bison consumption rates by comparing biomass inside and outside of temporary exclosures. NPP was estimated as the amount of biomass accumulation plus the amount consumed by bison, and grazing intensity as (consumption/NPP)*100. Temporary exclosures were constructed in March 2004 and moved in June 2004, and biomass was clipped in June and August 2003, and in March, June, and August 2004.

Net primary production did not vary with grazing during June-August 2003 and April-June 2004, but was significantly greater in the grazed treatment during June-August 2004 after adding consumed biomass. Light availability was consistently higher in grazed plots than inside exclosures. Grazing intensity varied between June-August 2003 (mean GI: 49% of productivity consumed) and April-June 2004 (14%) and was highest in June-August 2004 (68%). Preliminary analyses indicate that species diversity measures did not differ between grazed and ungrazed plots. Neither the proportion of exotic species nor the proportion of C4 grasses differed between treatments. Seed addition analyses are ongoing. The large variability in grazing intensities suggests that establishment of seedlings may be patchy, and may occur only where grazing has optimized establishment conditions. Therefore, analyses of light, water and biomass variability in grazed versus ungrazed areas are ongoing.

Results from these two studies will help identify how well different components of ecosystem functioning and plant diversity have been restored. Also, as bison and other grazing mammals are more commonly reintroduced as part of restorations, it will be important to know what effects they are having. Knowledge from these studies will hopefully be helpful to management of prairies at this and other locations.

Surface Water Sampling at Walnut Creek National Wildlife Refuge

Principal Investigator: Keith E. Schilling, Iowa Geological Survey, 109 Trowbridge Hall, Iowa City, IA

During Water Year 2004 (October 1, 2003 to September 30, 2004) the Iowa Geological Survey collected surface water samples on 22 occasions from Walnut and Squaw Creeks. Surface water samples were collected from 10 sites in both watersheds on a regular basis throughout the year. Sites are located at up and down-gradient USGS stream gauges, and three tributary locations. Surface water chemistry was monitored weekly in May and June, bi-monthly in April, July-September, and monthly in November to February. Water samples were analyzed for temperature, pH, specific conductance, dissolved oxygen, redox and turbidity in the field using a Hydrolab H20 water analyzer. Water samples are submitted to the University of Iowa Hygienic Laboratory for anions, fecal coliform, pesticides and phosphorus analyses.

Quantifying the Role of Riparian Land Use on Stream Bank Erosion and Nutrient Pollution

Principal Investigators: Thomas Isenhart and Richard Schultz, Department of Natural Resource Ecology and Management, Iowa State University, Ames; Keith Schilling, Iowa Geological Survey, Iowa City, Iowa

Sediment, phosphorus and nitrogen loading of Midwestern streams produces major pollution problems in these surface waters. While upland sediment and nutrient flow likely contribute

to non-point source pollution of surface water sources, sediment and nutrient flows from riparian row cropped fields, congregating areas within riparian pastures, stream bank erosion, or direct deposition of feces and urine may be more important to stream water quality because of their proximity to the streams. Providing riparian buffers of perennial plant communities that are not grazed may dramatically reduce movement of pollutants from this source area.

Specific Objectives:

1. Measure the amounts of sediment and nutrient losses from stream bank erosion in riparian areas managed as ungrazed grasslands, grazed pastures, forested riparian areas, reestablished native prairie buffers or cropland with and without buffers on the Neal Smith National Wildlife Refuge and on producer farms in the Squaw Creek watershed.
2. Quantify the reduction of sediment and nutrient loss from stream bank erosion in grazed riparian areas where fencing excludes livestock from the channel on producer farms with whom we worked during a previous study.
3. Monitor a sub-set of stream bank erosion sites in northeast, central and southeastern Iowa from the previous study that have been monitored for three years. The extended survey time will provide more temporal data that is so critical for watershed studies.

Studying bank erosion at the Neal Smith National Wildlife Refuge provides a unique opportunity to observe the overall potential of reducing surface runoff and bank erosion in a landscape that is being converted from intensive row-crop and grazing agriculture to a landscape dominated by re-established prairie and savanna communities. Since 1995, the Neal Smith NWR and adjacent Walnut Creek watershed have been monitored for daily discharge and sediment. In 1998, a detailed survey of the seven miles of stream channel in the Refuge was conducted. Variables measured during the survey included: left and right bank erosion, stream bed thickness, debris dams and livestock access, riparian land cover and tile locations. In addition, 25 detailed cross-sections were surveyed over the seven-mile stretch. A one mile reach of the creek is grazed by continuous stocking during the spring and summer months. In this reach, the survey demonstrated severe bank erosion and accumulation of fine stream bed sediment to depths of more than one foot. Numerous livestock entry points were observed along the reach. The data from this earlier work will provide a temporal comparison to the proposed survey of the stream in this proposal. During the period of time since the 1998 survey, significant progress has been made in re-establishing native prairie and savanna communities along the stream. In 1998, it was estimated that stream bank erosion accounted for 51% of the sediment load in the channel. With the increase in perennial plantings along the channel since that time, it is assumed that stream bank erosion contributions to channel sediment load have increased. Channel morphology has also changed during this time period. New cross-sections should show that the channel has been actively widening following earlier incision. The rapid widening contributes to the high sediment load from stream bank erosion.

The Squaw Creek watershed remains in row-crop and grass pasture cover, typical of much of the north-central part of the state. This watershed had higher annual sediment loads than Walnut Creek in 1998. Greater differences may now be expected after six years of extensive perennial plant community establishment in Walnut Creek. The comparisons of these two-paired watersheds will provide a baseline of the potential reductions in stream bank sediment production that could achieved with total perennialization of the watershed. While this is unlikely to happen in any other watershed in Iowa, it provides an upper limit of the kind of reductions that could be possible.

Beyond site-specific assembly rules: species traits as predictors of the frequency of occurrence of Lepidoptera in restored tallgrass prairies
Principal Investigator: Keith S. Summerville, Ph. D., Department of Environmental Science and Policy, Drake University, Des Moines, Iowa

Restoration ecologists are increasingly turning to the development of trait-filter models to predict how species move from regional species pool into a restored community. Two often untested assumptions of these models, however, are that ecologists have an understanding for which traits are predictors of species distribution and whether traits interact to determine the community membership. The goals of this study were to sample the regional species pool of Lepidoptera and to determine whether combinations of species traits predispose species toward becoming members of the actual species pool within restored prairies. In 2004, we sampled 259 moth species from 13 tallgrass prairie remnants and restorations in central Iowa, including 164 species from Neal Smith National Wildlife Refuge. We used principle components analysis (PCA) to identify significant combinations of ecological traits that were shard by large groups of moth species. Logistic regression was then employed to test for significant effects of the trait combinations on the frequency of prairie sites occupied by moth species. The PCA partitioned eight moth traits into four axes that explained a total of 81.6% of the variance. Furthermore, our logistic regression model detected highly significant effects for all PCA axes on the fraction of sites occupied by moths. Species most frequently filtered from the regional species pool into prairies were those that: (1) had long flight periods and were multivoltine (2) displayed a feeding preference for legumes but not the Asteraceae or other forb families, and (3) were regionally abundant but relatively small in body size. Ordination revealed significant differences in moth community composition among prairie sites, suggesting trait differences among species partly drive patterns of β-diversity among prairie sites. Finally, our results suggest that a combination of stochastic and deterministic mechanisms interact to determine how moths attain community membership within restored habitats, and that these processes may operate relatively slowly for univoltine forb specialists with restricted distributions.

** *This research is being written in manuscript form for submission to the journal Conservation Biology in spring 2005.*

Note: Beginning in 2005, Dr. Summerville will use a multi-year grant from USDA to continue his butterfly and moth research at Neal Smith National Wildlife Refuge.

Monarch butterfly activity at Neal Smith National Wildlife Refuge: Summer and Fall 2004
Principal Investigator: Robert D. Woodward, Ellis and Nelle Levitt Professor, Drake University, Des Moines, Iowa

The monarch butterfly activity at Neal Smith National Wildlife Refuge was observed from late June through the end of September 2004 to determine the extent of the both the "resident population" in the summer and visits by monarchs during the fall migration period.

Field observations tended to show the importance of Neal Smith as a key refuge for monarchs in the contemporary environment. Reports from other parts of the nation in 2004 suggested a dramatic decline in the monarch population yet substantial monarch activity was documented by field observations in the summer and fall at Neal Smith.

An old seed production site on the Refuge was used as the primary study area for observing summer monarch activity. In the small area, the variety of wildflowers and milkweeds—the host plants for monarch caterpillars—regularly attracted monarchs from June 23 through August 27. Away from the Refuge across central Iowa, monarchs were being reported much less often. One factor at Neal Smith coincided with many reports from Iowa and other parts of the nation—that few monarch caterpillars were being observed on milkweed leaves. Daily studies of milkweeds in the production site and other areas of Neal Smith indicated little to no presence of the caterpillars.

Nationally, several major studies were reporting significant declines of the numbers of monarchs migrating during the fall 2004. However, at Neal Smith, solid migratory activity was observed from late August until the end of September. Anecdotal reports for the period can be found at http://www.drake.edu/monarch/migration2004.html . Based on yearly studies of fall migration over central Iowa since 1997, it's fair to say Neal Smith has become a key stopover area for migrating monarchs.

The Reintroduction of a Declining Insect Associated with an Endangered Ecosystem: A Case Study with *Speyeria idalia* (Regal Fritillary) in a Reconstructed Prairie in Central Iowa

Principal Investigators: Diane M. Debinski and Stephanie Shepherd, Ecology, Evolution and Organismal Biology, Iowa State University, Ames, IA

Abstract: The decline of many prairie endemic butterfly species in the Midwestern United States has been well documented. These species declines are strongly associated with the destruction and fragmentation of their prairie habitat. One conservation strategy that can be used to compensate for both the loss of prairie and its endemic insect fauna is the reintroduction of rare butterfly species into reconstructed prairie areas. We are examining approaches to reintroduce *Speyeria idalia*, a declining prairie endemic butterfly, to a 1,250-hectare reconstructed prairie at Neal Smith National Wildlife Refuge, in Iowa. We first established 1,980 individuals of *S. idalia's* host plant, *Viola pedatifida* (blue prairie violet) at the Refuge during 1998-1999. Then a total of seven gravid *S. idalia* females were moved during 2000-2001 from two abundant source populations to the Refuge and placed in mesh cages over violet plots. Surveys for larvae and adults were conducted during the summers following reintroduction. In 2002 and 2003, adult *S. idalia* were sighted in several places across the Refuge in early July and they persisted through late August. Maximum numbers observed were on the order of 84 individuals. The presence of females was never confirmed on Refuge property during 2002 or 2003. However during 2004, the butterfly was still present in good numbers and females were documented on the Refuge. Therefore, it appears that in the case of *S. idalia*, reconstructed prairies may serve as adequate habitat. Additional time will be required to determine whether the population will sustain long-term viability.

Evaluation of isolated and integrated prairie reconstructions as habitat for prairie butterflies

Principal Investigators: Stephanie Shepherd and Diane M. Debinski, Ecology Evolution, and Organismal Biology, Iowa State University, Ames, IA

Reconstructing prairie habitat is one of the most promising techniques for conserving the imperiled prairie ecosystem and its associated organisms. However the degree to which

reconstructed prairies function like remnant prairies has not been fully examined. We evaluated the effect of restoration planting prescriptions, management, and vegetative quality on butterfly communities inhabiting prairie reconstructions in central Iowa, USA. Twelve isolated reconstructed prairies (small, surrounded by agriculture), 12 integrated reconstructions (planting units in a larger matrix of reconstructed and remnant prairies at Neal Smith NWR), and 12 remnant prairies were surveyed for butterfly and plant diversity, abundance and composition. Remnant prairies supported significantly higher butterfly richness and plant diversity but were not significantly different from reconstructions in butterfly species composition and abundance. Remnant prairies also supported significantly higher richness and abundance of habitat-sensitive butterfly species. Reconstructions that were the most similar to remnant prairies in plant diversity and percent native plant species did not support significantly different butterfly communities than lesser quality reconstructions based on measures of butterfly richness, abundance and composition. However, butterfly richness and abundance were highest on high quality reconstructions. There was also a trend towards higher butterfly richness on integrated reconstructions (sites at Neal Smith NWR) when compared to isolated reconstructions. Finally, the best vegetative predictors of butterfly richness (R^2 = 0.38) and abundance (R^2 = 0.13) were the availability of nectar and the % cover of duff (which is related to management issues such as time since burning). In conclusion, we found that the response of the butterfly community to vegetation in a reconstructed prairie is more complex than simply a response to vegetation diversity. Both management and landscape context of the restoration also play an important role (photo 8).

Arthropod collecting at the Neal Smith National Wildlife Refuge
Principal Investigator: Steve M. Spangler, Ph.D, CCA, 9468 Indian Hills Drive, Clive, IA

The objective of this preliminary work was to develop a framework for future long-term, funded studies relating to re-establishment of arthropod communities associated with the on-going tallgrass prairie reconstruction at the Refuge.

Various arthropod-collecting techniques were used as outlined below. The following sites, as recommended by the Refuge Biologists, are referenced in the discussion below: 'NE Entrance', 'Cabbage', 'Dogleg', and 'Coneflower'.

Three sets of five sweeps per location were taken at the NE Entrance, Cabbage, and Dogleg sites on September 3 at about 11 a.m.

Three to five traps were used at the NE Entrance, Cabbage, Dogleg, and Coneflower sites, for a 48-hour period, from about 11 a.m. on September 3 through 11 a.m. on September 5.

One Malaise trap at each of the NE Entrance and Cabbage sites, for a 48-hr period, from about 11 a.m. on September 3 to about 11 a.m. on September 5.
One light trap at each of the NE Entrance and Cabbage sites, for a 24-hr period, from about 11 a.m. on September 8 to about 11 a.m. on September 9.

An entomological collection is being developed at the entomology laboratory at NSM as specimens are identified. It is anticipated that specimens of the Homoptera, Hemiptera, and Coleoptera will be identified eventually to the species level. Other taxa that are analyzed will be identified to Family level.

Ten to fifteen species of Homoptera. Hemiptera and Coleoptera were identified from the sweep sampling from the NE Entrance, Cabbage, and Dogleg sites. Indices of diversity indicated fairly similar levels of diversity, however, the habitat closest to agricultural habitat, the Cabbage site, tended to have certain species much more abundant which are common in agricultural habitats (*Empoasca* sp., *Lygus lineloaris*, *Diabrotica* sp.).

A note of caution here is that these habitats at the NSM can have noticeably different volume of vegetation, which may result sampling errors in comparing habitats because of variable sampling efficiencies relative. In the future, foliage sampling may need to be done with a method other than sweep net sampling.

Five to fifteen species of ground-dwelling Collembola, Coleoptera, Hymenoptera, and Orthoptera were identified from the pitfall sampling from the NE Entrance, Cabbage, and Dogleg sites. Indices of diversity were highest in the Dogleg site; this site had greater numbers of ant (Formicidae) species, and also had greater numbers of Gryllidae. The NE Entrance and Dogleg sites, particularly the Dogleg site, also had noticeably greater numbers of ground beetles (Carabidae). Springtails (Collembola), which feed on dead plant material (detritus), were noticeably more abundant in the reconstructed sites (NE Entrance and Dogleg) compare3d with the first-year site (Cabbage). Thius, in general, these pitfall trap samples indicated greater abundance and number of species of ground-dwelling ants (Formicidae), springtails (Collembola), and ground beetles (Carabidae).

Survey of Mycorrhizal Symbioses at Neal Smith National Wildlife Refuge
Principal Investigator: Inger Lamb

Evaluating the effects of the soil system on seedling establishment and growth is a complex task. In addition to soil mineral and nutrient availability, the below-ground biological component has an enormous potential to influence plant growth and survival. The sheer complexity of the interactions and influences of the soil biological and mineral environment can make research intimidating.

Nevertheless, projects designed to establish vigorous and long-lived perennial ecosystems (especially on soils in transition from traditional agricultural practices) require an understanding of the soil microflora if they are to be successful. In Iowa there is considerable interest in establishment of native perennial plants, for a variety of reasons ranging from re-establishment of the original ecosystem to energy and food production from low input perennial plant systems. Any desire to mimic the original flora must include consideration of the soil environment. Optimal soil properties and function are also very important to consider when designing or developing a reduced-input perennial production system.

Mycorrhizae are one of the soil biological components frequently ignored or at best poorly evaluated and understood. Essentially no research has been done documenting the extent or importance of mycorrhizae in Iowa prairies. This is unfortunate considering the potential benefits and essential nature of this common root-fungal symbiosis, and the probable importance in the prairie ecosystems being re-established in Iowa.

This study involves a survey of mycorrhizal associations in remnant (virgin) and reconstructed prairies at Neal Smith National Wildlife Refuge. Techniques for root sample processing and

spore isolation and identification will be developed to fit the facilities. The results will be establishment of baseline data and experimental protocols that will be used to direct and develop future research on this important soil component. Data produced will be made available to any interested party, with the intent of encouraging follow-up studies by graduate students, interns, and other researchers from a wide range of institutions. Sampling is scheduled to begin in December 2004.

Evaluation of methods for Canada thistle-free habitat restoration
Brd Principal Contact: Diane Larson, Research Wildlife Biologist
Affiliation: Northern Prairie Wildlife Research Center

The National Wildlife Refuge System has an active habitat restoration program and annually seeds thousands of hectares to native plant species. In FY2003 alone, Region 3 restored 26,690 wetland acres and 7,394 upland acres. The noxious weed, Canada thistle (*Cirsium arvense*), plagues these restorations, however. Because its control is mandated by law, it is often necessary to apply herbicide or mow at a time that is detrimental to the success of the restoration as a whole. Disturbance at this early stage of the restoration may, in fact, weaken the native seedlings as much or more than it does Canada thistle, thus thwarting the potential of the native restoration to ultimately suppress Canada thistle and other weedy species. Continued control of Canada thistle may perpetuate the repeated disturbances that favor infestation by a variety of exotic plants, thistle included. The goal of the proposed research is to compare the ability of differing seed mixes and application techniques to suppress Canada thistle establishment in new restorations. We hypothesize that by increasing competition and decreasing the disturbance inherent in seeding, we can produce more weed-resistant restorations.

Potential effects on Canada thistle abundance in restoration of cultivated land is divided into four categories: (1) disturbance, (2) competition, (3) site characteristics and (4) year effects. We will experimentally manipulate disturbance and competition, but must also take into account site characteristics and year effects. Three seeding techniques will constitute differing amounts of disturbance: broadcast seeding during the dormant season is expected to inflict the least disturbance to the seedbed, spring seeding with a seed drill the most, and spring broadcast seeding should be intermediate. We will vary competition through the use of three different seed mixtures. A cool-season grass dominated mix should compete directly with Canada thistle seedlings, which also emerge early in the spring. A warm-season grass dominated mix, while emerging later than Canada thistle, may be more efficient at nutrient uptake and ultimately out-compete thistle through nutrient usurpation. Each of these mixes will have low diversity (eight species). A high diversity mix (at least 35 species) with several species from each functional group may effectively utilize all available niches, thus excluding Canada thistle. Site characteristics we will need to take into account include the existing Canada thistle propagule bank and soil fertility and moisture. Year to year variation, over which we have no control, include seasonal temperature and precipitation, which will influence both the probability of Canada thistle and native seedling establishment, though perhaps not equally.

The study will be conducted at Neal Smith National Wildlife Refuge, Fergus Falls Wetland Management District, Morris Wetland Management District, Litchfield Wetland Management District and Minnesota Valley National Wildlife Refuge. Total area treated in each field will

be approximately four acres. The four acres will be divided into 108 cells, each 12.2 x 12.2 m (40 ft x 40 ft, or 0.0367 acre), which will allow five passes by a typical 2.44 m (8 ft.) seed drill. Sampling (see below) will be restricted to a 2 x 6 m plot in the center of the treated cell to avoid edge effects. To minimize disturbance, cells will be oriented in the field such that each can be reached without crossing another cell; a buffer zone will separate rows of cells to accommodate equipment and site access. Treatments will be assigned to cells at random with 12 replications per treatment in each field.

We will employ three seeding methods and three seed mixes, fully crossed, for a total of nine treatments. The three seeding methods include a dormant season broadcast seed application, a spring broadcast seed application, and a spring seed drilling application. Seed mixes will include two low diversity mixes, one dominated by warm-season grasses, similar to currently used seed mixes, and the other dominated by cool-season grasses. Total species richness in the mix will include only one or two species in each functional group, with the exception of the cool or warm-season grasses, which will have three or four species. The high diversity mix will include at least seven species in each functional group. Functional groups include warm-season grasses, cool-season grasses, warm-season forbs, cool-season forbs, and legumes. To the extent possible, seeds will be collected from sites near the fields to be seeded. Additional seed will be purchased from the nearest available supplier as needed. We will plant 50-60 seeds/m^2 in the drilled application and 60-75 seeds/m^2 for broadcast seedings. Fields will be mowed once in the first year for weed control. We will apply glyphosate and 2,4-D to the spring broadcast field prior to seeding, per normal restoration practice.

Prior to seeding, we will collect soil samples from each cell in each field. Soil will be collected within a 0.5m buffer around each plot using a 2.54 x 10 cm soil corer. We will collect five cores in each of the cells and composite the soil over four-cell blocks (to retain some geographic structure in the data). Soil thus collected will be used to determine average (1) nitrogen availability, (2) soil moisture, and (3) the Canada thistle propagule bank in each field, as well as any gradients across each field. Soil on all fields will be collected within a one-week period.

To assess nitrogen availability in soils we will perform lab incubations on a subset of the soil (approximately 1/5 of soil collected). We first will extract a sub-sample of the collected air-dried soil (referred to as the "initial" sample) with 2 M KCl. A second sub-sample of equal portion will be brought to field capacity (optimal moisture conditions for microbial activity), covered, and allowed to incubate for 28 days at room temperature. Following the 28-day incubation, the sample will be extracted with 2M KCl (the "final" sample). Extracts will then be analyzed for nitrate/nitrite and ammonium, the common available nitrogen compounds in soil using an OI Corporation SF3000 autoanalyzer. Subtracting the initial sample value from the final sample value gives the potential rate of nitrogen mineralization and nitrification, or the potential amount of nitrogen available to plants under ideal conditions, which provides a basis for comparison among the fields. Details of the methods can be found in Robertson (1999).

Rather than measuring soil moisture directly, which is costly and difficult across large landscapes, we will determine soil texture (percent sand, silt and clay). Soil texture is directly related to water holding capacity and will provide, together with precipitation, an index of relative moisture at each site. We will use the hydrometer method as outlined in Day (1965).

Gross (1990) determined that germination with stratification was the most reliable method to assess viable soil seedbanks. To determine the number of Canada thistle propagules in each field we will first sieve the soil to remove root fragments ≥ 2 cm. Root fragments will be mixed with sterilized potting soil and spread over a 2.5 cm layer of vermiculite in greenhouse flats. A paper towel will separate the vermiculite from the soil. Remaining soil will be cold stratified for six weeks, then spread to a depth of 2 cm over a 2.5 cm layer of vermiculite, separated by paper toweling, in greenhouse flats. Flats will be placed in a greenhouse and kept moist, with light regime and temperature consistent with the growing season in the upper Midwest. Root fragments and seedlings will be allowed to grow until no new plants are detected for seven days. At this point, plants or seedlings that can be identified as Canada thistle will be counted and removed. If identification is equivocal, seedlings will be allowed to continue growth until they can be identified; this may entail transplanting seedlings to larger pots. Results will be expressed as average number of Canada thistle root sprouts and seedlings per cubic meter of soil in each field. We will also assess any gradients across each field.

For post-treatment sampling, we will sample the plant community on each plot using a composite of 12-0.5 x 2 m quadrats. The quadrats will allow more complete searches for individual species, while dividing the plot into sufficiently small sections for accurate cover estimation. On each quadrat we will determine aerial cover of each species using Daubenmire cover classes (Daubenmire 1959). We have chosen to use aerial cover because it is directly related to biomass (Elzinga et al. 1998). Coefficients of Conservatism will be assigned to each species, based on published sources. In addition, we will conduct Canada thistle stem counts on a sub-sample of each plot, with the size of the sub-sample depending on the density of Canada thistle stems. Counts will be standardized to stems/m^2. The plant community will be assessed in May and July of each year. Canada thistle stem counts will be assessed in July.

Expected Products: Results of this project will be incorporated into management recommendations for planting methods and seed mixtures when Canada thistle and other invasive plants threaten prairie restorations. The sampling design and monitoring protocols are fully transferable to other refuges with prairie habitat. The measurement model developed for this project can also guide future monitoring efforts by identifying additional factors that influence invasibility and that may interact with factors we can manipulate to produce varying – and unexpected – results.

We anticipate, in addition to annual and final reports to the refuges and Region 3, at least two peer-reviewed publication and several oral presentations at meetings and workshops as appropriate. The topic of one paper will be the outcome of the restoration trials. The topic of the second paper will be the utility of multivariate hypothesis testing (e.g., structural equation modeling) for the development of monitoring plans. All reports and publications will be available through the Northern Prairie Wildlife Research Center (NPWRC) web site.

Publications Resulting from Research Conducted at NSM this Year:

Lewis, M. N., R. M. Steichen, and K. S. Summerville. (in press). The diversity of moths in Tallgrass prairies of Iowa: a preliminary assessment. *Journal of the Iowa Academy of Sciences*. (Publication expected in March 2005).

Summerville, K. S., M. N. Lewis, and R. M. Steichen. (in press). Restoring lepidopteran communities to savanna remnants: contrasting effects of habitat quantity and quality. *Restoration Ecology*. (Publication expected in the second quarter, 2005).

Zhang, Y-K, and K.E. Schilling. 2004. Effects of land cover on evapotranspiration, soil moisture and groundwater table and recharge: field observations and assessment. Journal of Hydrology. In review.
Zhang, Y-K, and K.E. Schilling. 2004. Impact of vegetation on main hydrological processes: a field study and its implication for water quality. Advance in Earth Sciences 19(3): 422-428.
Drobney, P.M. and K.E. Schilling. 2003. Treatment of Reed Canary Grass Monoculture Improves Water Table Levels for Sedge Meadow Restoration (Iowa). Restoration and Management Notes. 21(4):323-324.
Schilling, K.E., Zhang, Y-K, and P. Drobney. 2003. Water Table Fluctuations Near an Incised Stream, Walnut Creek, Iowa. Journal of Hydrology. 286:236-248.
Zhang, Y-K, and K.E. Schilling. 2003. Temporal Scaling of Hydraulic Head and River Baseflow with Implications for Groundwater Recharge. Water Resources Research. W03504, doi:10.1029/2003WR002094.

Grants Supporting Research at NSM:
Hydrologic Studies: Keith Schilling et al.
USDA, Conservation Effects Assessment Project (CEAP)Iowa State University to evaluate economics of conservation practices in three watersheds in Iowa - $645,000
(NOTE: One watershed evaluated in this study is the Walnut Creek watershed – primary evaluation of this watershed will be by the Iowa Geological Survey. A calibrated SWAT model and sediment delivery model will be constructed for the Walnut /Squaw Creek basins by IGS personnel. The model will be given to ISU economics team for evaluation of conservation cost/benefits.) Grant date: October 1, 2004.

Savanna Research: Heidi Asbjornsen et al
Iowa State University: $38,000
U.S. Forest Service: ca. $60,000

Agroecosystem Research: Heidi Asbjornsen et al
U.S. Forest Service: ca. $100,000
Leopold Center for Sustainable Agriculture: $125,000
Iowa State University's Agroecosystem Initiative: ca. $110,000

Streambank Erosion and Nutrient Pollution: Tom Isenhart et al
Leopold Center for Sustainable Agriculture: $177,230

Moth Studies: Keith Summerville
National Aeronautical and Space Administration: $10,000. Duration - 1 year.
National Geographic Society: $15,000. Duration - 1 year.
Drake University small research grant: $10,000. Duration - 1 year.
USDA Managed Ecosystem Grant: $70,000. Granted for 2005. Duration is 2.5 years.

Mycorrhizal study: Inger Lamb et al
Leopold Center for Sustainable Agriculture. $25,000. Granted for late 2004 through 2005.

Canada Thistle Study: Diane Larson et al. (Note: this study includes 4 FWS stations).
United States Geological Service. $192,000
FWS, Region 3. $68,500
Total funding contributing to research at NSM this year: $1M

Photo 1 – Federally endangered Indiana Bats are found on the Refuge

Photo 2 - Researcher using Anabat technology at Thorn Valley Savanna

Photo 3 – Monitoring wells are in place on the Cabbage Unit

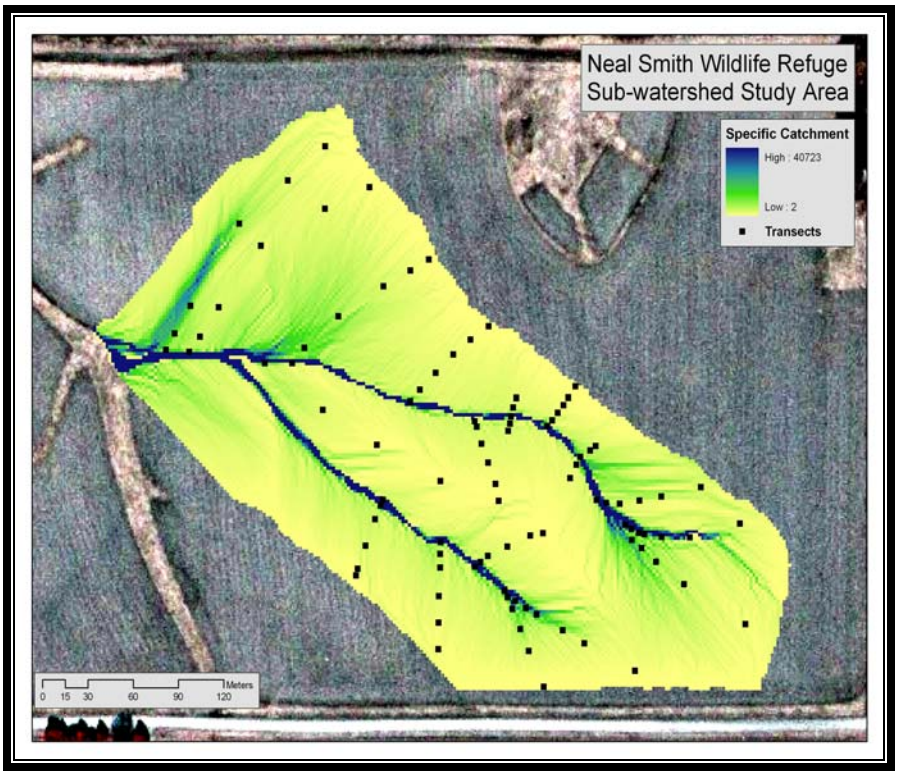

Photo 4 – Map of catchments installed at Cabbage Unit


Photo 5 – Device on right measures sheet erosion

Photo 6 – Schilling (R) measures water table in Sedge Meadow

Photo 7 – Sensitive fern and prairie blazing star growing at Sedge Meadow restoration site

Photo 8 – Regal Fritillary on common milkweed at Refuge

2

Habitat Restoration

2.a. Wetland Restoration

On-Refuge

Wetland restoration on the Refuge that has little historically hydric soils is tricky. When the Refuge was enacted, there were several farm ponds in place. These ponds were in areas that had a large watershed to fill the pond or areas that would have been side hill seeps. The Operations staff has breeched the dams of four ponds this year and will continue to remove dams in FY2005. The breeching of the dams will restore the natural hydrology to the landscape. If hydric soils are present, wetland species will be planted. If soils maps show no signs of hydric soils, only upland species will be planted.

On-Refuge

ROS Rich worked with two landowners this year to improve a wetland complex along Otter Creek in Warren County. These wetlands are located along the southern edge of the Des Moines lobe of the Wisconsin glacier (pothole region). This area was not historically pothole as it was a flood plain. The tests indicated that the soils were hydric throughout the area, thus a scourer was designed. The area is to mimic a flood plain scourer and is only 18-24 inches deep. The landowner will seed the banks and surrounding areas with native seed mixes and maintain water levels.

2.b. Upland Restoration

On-Refuge

The Refuge had a very active year in the area of upland restoration, from shearing and removing trees to picking and cleaning seed. Brian Boot, Maintenance Mechanic, spent a great deal of time operating equipment to prepare areas for seeding, spending several days shredding trees on the Birkenholtz site for converting cropland to prairie. Brian was also able to prepare three additional sites, Cabbage, Curry and Kane, for seeding and grading by mowing fence rows, shredding trees and removing trash and metal posts.

March brought the start of new life. Volunteers and staff started seed trays in the production greenhouse. These seedlings were used to replace plants within the production plots as well as be placed in areas of concern and erosion. Volunteers finished up seed cleaning operations in the seed lab and got equipment and supplies prepared for the fall seed collection.

Operations staff worked diligently in May to mow and maintain the 500 acres of cropland planted to prairie last year. They continued to mow to control thistle and enhance the growth of the native vegetation. Native plants started to take a strong hold in these areas and Operations did an excellent job handling the daunting task of mowing 500 acres (photo 9).

The entire staff made an outing to the Coneflower Prairie to collect blue-eyed grass seed. Staff was able to collect a substantial amount of seed which establishes quickly and serves as a good “healer” plant for restored prairies.

In August, Operations inter-seeded approximately 200 acres to try and increase diversity along road sides, ditches, and chemically treated areas of brome grass.

Boot and Hager prepared for the machine seed harvest which began in late September. In only four days, they were able to harvest 6,300 bulk pounds of grass and forb seeds, WOW! NICE JOB! Boot started to contour terraces and roadsides of old crop fields to give the restoration areas a more even flow from the road into the prairie. Good coordination of hand collection between Public Use and Biology resulted in a very hefty seed collection, even adding a couple of new species to the collection list including nimblewill, obedient plant and foxtail dalea. The seed lab became a very active and busy place and the huge influx of seed was a result of dedicated staff, volunteers and the simple act of working together to accomplish a worthy task.

We targeted several species for this year's harvest - big bluestem, little bluestem, goldenrod, coneflower and Canada wild rye. Approximately 13,705 bulk lbs. of seed were harvested and processed from ten sites. Seed was dried and cleaned at the Refuge and kept in Refuge facilities in seed storage boxes (Photo 10).

Each site was monitored and harvested at optimum time for target species. Analysis of seed viability and purity of material harvested by machine on refuge indicated adequate purity in grass crops. The abundant amount of rainfall provided a bountiful harvest and seed amounts and viability were high compared to last year (5,800/3,000 bulk lbs.). The large harvest gave us plenty of seed for next year: Indian grass – 1,104 pure live seed (pls)/lb, big bluestem – 1,099 pls/lb, little bluestem - 973 pls/lb, goldenrod - 194 pls/lb, coneflower - 146 pls/lb, and 41 pounds of aster (photos 11 – 28).

December brought some unusually pleasant weather which allowed the Operations staff to mix 5,200 pounds of seed mix (700 lbs. forbs) and seed 274 acres. After modifying a recently purchased Viacon seeder, Operations staff spread seed on the Cabbage, Curry, and Kane units. An additional 57 acres were inter-seeded. Staff and volunteers worked throughout the month of December and into late winter cutting and bucking up trees and piling up brush piles.

On-Refuge

Most of this year's off-refuge restorations were enhancements, not restorations. Rich worked with two landowners who had over 70 acres of remnants on their property. This allowed for several new techniques to be used. The use of tree removal is one that Rich has not used in the past as well as the use of contractors for invasive species removal. The areas (30 ac) around a Madison County remnant were planted to natives harvested off the adjacent prairie. Some local ecotype forbs were added to the mix and a chemical burn was employed by the landowner. All landowners were given a management plan and provided the necessary knowledge to restore a prairie.

2.c. Deepwater/Riverine Restoration

On-Refuge

Nothing to Report

Off-Refuge

Nothing to Report

Photo 9 – Canada thistle rearing its ugly head

Photo 10 – Harvesting with the combine

Photo 11 – Black-eyed Susan

Photo 12 – Bee Balm

Photo 13 – Blue Vervain

Photo 14 – Butterfly Milkweed

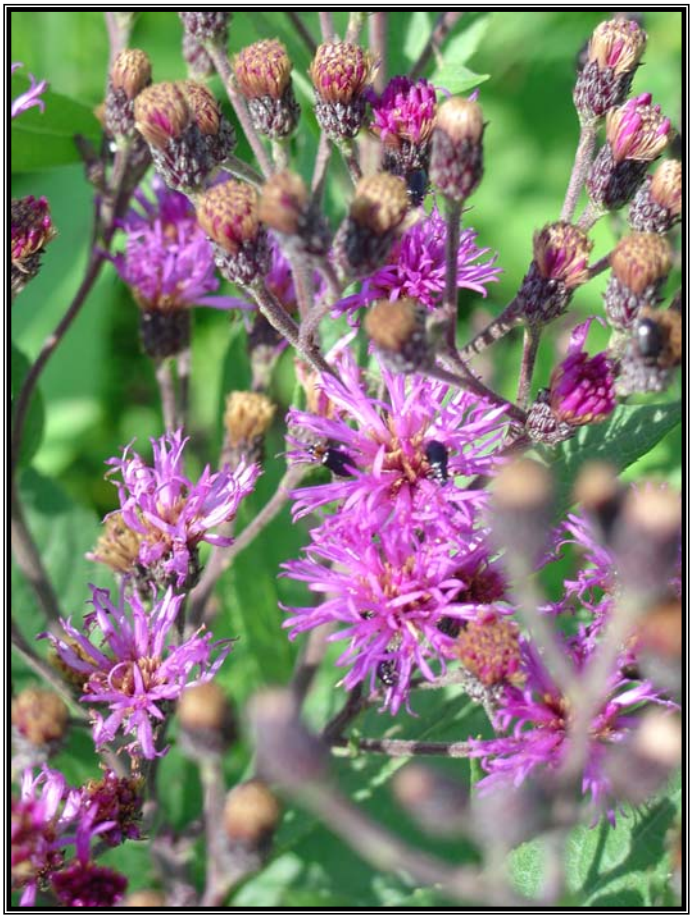

Photo 15 – Ironweed

Photo 16 – Giant St. John's-wort

Photo 17 – Greyheaded Coneflower

Photo 18 – Self-heal

Photo 19 – Joe-Pye Weed

Photo 20 – Obedient Plant

Photo 21 – Pale Purple Coneflower

Photo 22 – Prairie Coriopsis

Photo 23 – Prairie Phlox

Photo 24 – Purple Prairie Clover

Photo 25 – Scaly Blazing Star

Photo 26 – Showy Tick Trefoil

Photo 27 – Starry Campion

Photo 28 – Swamp Milkweed

3

Habitat Management

3.a. Water Level Management

Wastewater Wetland

The Refuge uses a constructed subsurface flow wetland to provide tertiary treatment or "polishing" of effluent leaving the septic tank (photo 29). The wetland system is utilized because it offers a very desirable and environmentally compatible alternative to a septic drainfield, which studies had shown to have severe limitations in the area proposed for the Prairie Learning Center. Through a complex series of physical, chemical and biological processes, the wetland environment naturally breaks down or "polishes" the effluent as it passes through the porous rock medium and over plant roots and stems on which bacteria, algae, microflora and fauna are present. In addition to polishing, the plants and organisms extract water, nitrogen and phosphorous from the effluent for their own use, sequester some contaminants in cell tissue or in sediment and provide habitat for numerous vertebrates and invertebrates.

The wetland is monitored and operated by the Operations staff to meet NPEDS permit discharge requirements. Daily inspections and recording of water use, weather, water level, plant vitality and discharge volume; monthly water sampling, testing and reporting; and frequent vegetation control within the cells and surrounding area are required to keep the wetland functioning properly. The water quality of the discharge from the wetland has consistently been better than the permit requires.

3.b. Moist Soil Management

Nothing to Report

3.c. Graze/Mow/Hay

Mowing is an integral part of prairie reconstruction at Neal Smith NWR. Mowing takes place as a first and second year management tool on new prairie plantings. Also, mowing is used to control broadleaf weeds and woody vegetation to promote native growth. Approximately 1,840 total acres were mowed in FY04, consisting of prairie plantings, firebreaks, demolition sites and weed management sites.

3.d. Farming

Nothing to Report

3.e. Forest Management

In February, a contractor cut trees in Thorn Valley Savanna to further savanna restoration. Staff followed behind chemically treating stumps to prevent regrowth. Excellent progress was made and a wide area was successfully cleared freeing up oaks to sunlight and promoting regeneration of young oaks as well as savanna ground cover. Volunteers worked steadily to remove the trees and brush from the savanna and form brush piles to be burned in winter. Some of the wood was made available to the public through a special collection permit.

Maintenance Mechanic Boot used the hydra-axe during FY04 on approximately 25 acres of trees. Van Zee used a tree shredder to cut four to five acres of trees encroaching into the prairie restorations (photo 30).

3.f. Fire Management

2004 NSM Fire Crew: Burn Boss-Severson ICT4 - RXB2 ,Drobney RXB3; Staff Crew Members- Boot, Braun, Gilbertson, Hager, Hollerich, Krueger, Latcham, Murray, Rich, Shea, S. Van Ryswyk, Van Zee ; Adjunct Crew Members (AD's)- Scott Bryant, Steve DeBruin, Todd Fritz, Roger Howell, and Mark Samson; Administrative and Base Radio Contact: Dykstra and D. Van Ryswyk.

Volunteer Smoke Spotters and Traffic Control: Nancy Andresen, Elmer Blythe, Gene Brown, Bob Buyert, Larry Cline, Laverne Collister, Cecil and Jean Cook, Mary Moore, Marilyn Samson, Robert & Mary Swan, Arleen Vander Ploeg, Kathryn Van Zee, and Ed Wade.

Wildfire Fighters: NSM Staff-Below- FFT2/LE, Braun- FFT1, Hager- FFT2, Hollerich-FFT2, Latcham-FFT2, Murray-FFT2, Severson-ENGB-ICT4, Van Zee-FFT2, Van Ryswyk-FFT2. AD's-Bryant-FFT2, DeBruin-FFT2, Girard-FFT1, Van Zee-FFT2.

The fire program at the Neal Smith NWR had a very busy and productive year. Considering all of the changes in the past year regarding systems, assessments and qualifications, this program was able to move forward and burn ecologically in a safe and efficient manner. Thanks to assistance from Operations, Biology and Public Use, fireline preparation was completed in a timely manner and Refuge staff was available on a moment's notice. The TEAM concept has taken hold within the fire program and the Refuge as a whole, and it is an exciting time to be part of this project.

It has been a challenge at times to prepare equipment and control lines for the prescribed fire season but the two Fire Range Technicians (Braun and Latcham) have done an admirable job of completing these tasks. In addition to this work, the fire crew (Severson, Braun and Latcham) assisted other Refuge departments in meeting our work plan goals for the year. These projects included: Ding Darling Day fence removal, plant rescue, stewardship Saturday, Earth Day fence removal, felling trees on the Savanna research plot, and others too numerous to mention.

In reality, the prescribed fire season really never ends. Even though the actual burning takes place during the fall and spring months, the revision of 15 prescribed fire plans and burn unit preparation is a year-long endeavor. During the fall burn season, three units were burned totaling 402 acres. The fall burn season ended with measurable snow in December. After the fall prescribed fire season and throughout the winter months, 38 brush piles were burned. These brush piles were formed during restoration activities on the Refuge in the last couple of years. The spring burn season began after a 14" March snow storm melted away. A total of eight units were burned during the spring season covering 1,616 acres. All burns were completed efficiently and more importantly, safely (photo 31 and photo 32).

In addition to burning on the Refuge, the fire crew traveled to Union Slough NWR, Effigy Mounds National Monument and Big Stone NWR to assist on six prescribed fires. Listed below are the burns completed during the year. Additional burning will take place throughout

the fall and winter months including brush piles and burn units requiring a northerly wind component.

Year	Name	Date	Acres
Fall 2003	Butterfly Hill	11/07	91
	Henslow Hill	11/13	191
	Basswood	11/21	100
	Brush Piles (38)	12/08	20
	Total Acres		**402**
	Acres/burn		**100.5**
Spring 2004	Coneflower	03/31	201
	Prairie Learning Ctr.	04/02	150
	Thorn Valley	04/07	192
	Bison North	04/09	391
	Interim	04/13	318
	Deer Valley	04/14	134
	High Point	04/27	180
	Savanna Reconst.	5/04	50
	Total Acres		**1616**
	Acres/Burn		**202**
	Total for Year		**2018**
	Acres/Burn		**168**

The western wildland fire season never really materialized this year even though all of the weather factors were in place. Last year, our local dispatch center mobilized 18 crews to send out west, compared to not one single crew being mobilized this year. This is in a large part due to the number of stations that requested severity engines. The Refuge engine and fire crew (Severson, Braun and Latcham) were dispatched in June for a 30 day detail on the Arizona Strip in southern Utah and northern Arizona. The fire crew was again dispatched to the Arizona Strip in August for a 14 day detail. The fire crew assisted in the suppression of 15 fires, the majority being from single tree lightning strikes. These fires were contained to less than an acre which illustrates the practical aspect of requesting severity funding. Besides the smaller fires, the crew worked on other fires ranging in size from 30 acres to over 18,000 acres. The crew performed well and received an excellent evaluation from the BLM Arizona Strip Field Office FMO. In addition to working on western fire details, the fire crew traveled within the Region to assist in wildfire suppression (photo 33 and photo 34).

Participation on wildland fire details is becoming more important to maintain current qualifications as well as to acquire new skills. Fire Range Technician Jeff Braun was able to serve as a look-out on one assignment and has successfully completed his ICT5 and FFT1 task books. Severson and Drobney coordinated the Refuge wildfire effort through the staff at the Missouri Coordination Center.

Training

This has been a busy year for staff members participating in fire-related training and staff instructing courses. Listed below are the particulars for the year:

Courses Provided By Refuge Staff

Course	Instructor	Location
S-290 Intermediate Fire Behavior	Severson	Neal Smith NWR
S-211 Portable Pumps and Water Use	Severson	Brooksville, FL
S-214 Engine Operations	Severson	Brooksville, FL
S-130 Firefighter Training	Severson	Iowa State University
S-190 Intro to Wildland Fire Behavior	Severson	Iowa State University
Annual Fire Refresher	Severson	Neal Smith NWR

Courses Completed By Refuge Staff

Course	Student	Location
S-290 Intermediate Fire Behavior	Braun	Neal Smith NWR
	Krueger	Neal Smith NWR
	Murray	Neal Smith NWR
S-211 and S-214 Pumps & Engine Ops	Braun	Brooksville, FL
	Hager	Brooksville, FL
S-131 Advanced Firefighter	Krueger	Springfield, MO
S-200 Initial Attack Incident Commander	Krueger	Springfield, MO
S-130 and S-190 Basic Firefighter	Latcham	Iowa State University
	McDonald	Iowa State University
Line Officer's Workshop	Gilbertson	Tallahassee, FL

In the coming year, the Refuge will offer S-130, S-190 and S-212, along with the annual fire refresher. The Refuge continues to serve as the area's premier training venue for prescribed fire and wildland fire in the state.

Severson continues to encourage the Chief of the Prairie City VFD to sign a cooperative agreement for firefighting. Currently the agreement is before the Prairie City VFD Board. Through this agreement, the fire department would assist on wildland fire suppression on the Refuge and the Refuge fire crew would be available for suppression activities outside of the Refuge boundary. Severson and Drobney attended three meetings concerning standards and qualifications for prescribed fire in Iowa. All of the different agencies as well as private contractors were represented at these meetings. A Prescribed Fire Conference is slated for February 2005 and both Severson and Drobney are on the planning committee.

Additional meetings were held with the Iowa Department of Transportation concerning burning roadside areas sown to natives. These discussions centered on developing prescribed fire plans, qualifications, and logistics. Finally, Severson organized and attended a meeting with the Iowa Department of Natural Resources Biologists for Boone, Guthrie, Polk, and Greene counties. The DNR manages several Water Fowl Production Areas (WPA) that require prescribed fire. Several critical points were discussed during these meetings including the need for training and equipment in order to carry out these burns safely. The Refuge fire program has made a commitment to assist the DNR in carrying out these burns.

3.g. Pest Plant Control

Canada thistle is a problem throughout the Refuge and is treated using TransLine or RoundUp and early mowing. Reed canary grass is a problem in dry creek bottoms and is treated with well timed mowing and spraying sequences using Rodeo or RoundUp. The wet weather really caused problems in controlling some of these species. This year was a continuous struggle to keep up with the mowing and spraying requirements. Other target species included sweet clover, musk thistle and black locust, yellow and white sweet clover, crown vetch and *Rubus parvifolius* (no common name available). Rich, Hager, Bruns, Boot and Van Zee treated approximately 200 acres of problem areas during FY2004.

Pesticide records are maintained on the Refuge to document the amount and type of chemical used within each planting site or other management area. Thirty-two gallons of chemicals were used this year including RoundUp, Rodeo, 2,4-D, Garlon 3A and 4, and Transline.

One focus was on location and treatment of highly invasive, exotic plant species. Among species of special concern on the Refuge are serecia lespedeza (*Lespedeza cuneata*), *Rubus parviflorus*, and black locust (*Robinia pseudoacacia*). Though there are many exotic species on the Refuge, these are especially insidious and will result in a need for significant additional management resources for control in the future if left unchecked.

Serecia Lespedeza - The biggest invasive species scare faced during the period was the discovery of serecia lespedeza. Lespedeza was discovered in October of 2003 in a unit being machine harvested. Hager brought an unknown plant to Drobney who recognized it as serecia lespedeza. This highly invasive species readily clones, is fire tolerant, and can exclude other plants due to deep and extensive root systems. Within 24 hours of identification, the area had been extensively surveyed and plants treated with Garlon 3A. Plants were approximately two to five feet in basil diameter, and were in flower though no fruits were found. Follow-up survey of the area revealed no additional plants.

Despite the good news, there is more bad news. In December 2003, an old brome (*Bromis inermis*) field was planted with prairie seed after a late fall burn. In late summer of 2004, numerous plants were detected on the western edge of this unit within an area approximately 200 feet from field entrance. Because serecia lespedeza had been found elsewhere on the Refuge, we were especially sensitive to the possibility that we may have inadvertently harvested seed contaminated with serecia lespedeza, and replanted it in this site. This seemed unlikely as no one had reported a population of this species which is bright green and apparent in contrast to dried prairie vegetation during harvest season. Presence of a population large enough to supply the amount of seed needed for a population the size of that observed on Basswood would have been apparent to harvesters. Our two concerns were to eliminate the discovered population and to detect others, if present, on other portions of the Refuge.

In fall 2004, the field with serecia lespedeza was treated with Transline a few days after the first observation of the species. This chemical is selective for legumes and composites and its use would preserve prairie species in other families. Evidence of effectiveness came slowly, and it was not until late in the season that the leaves began to turn yellow. Though this is typically the season that native warm season prairie species begin to turn brown, normally serecia lespedeza is bright green during this time. As such, it is likely that chemical treatment was effective, at least to some degree. We will continue vigilance in the 2005 growing season.

A large offensive of staff and volunteers was launched to canvas the Refuge to locate and map other populations of lespedeza. We focused initially on areas that had been planted from fall 2003 to spring 2004 using the same seed mix as that used on Basswood in case it was inadvertently planted. Serecia lespedeza would have been obvious in the mowed, late season plantings, but no serecia was found. Additional checks were done by staff and volunteers on other plantings including the area where serecia lespedeza had been observed in past years, again with no additional observations of this invasive species.

Literature indicates that serecia lespedeza was planted in the 1940's for erosion control on steep dry areas, though it proved to be a poor solution to that problem. Seed needs to be scarified to germinate. The brome field where it was discovered had had no treatment except mowing since the Refuge started. It is unlikely that plants were present in this area, as they would have provided a notable contrast to the brome in height, color, and texture and would have been observed. It is possible that a past planting of serecia was sprayed with herbicide for pasture improvement thus eliminating parent plants, but not dormant seed. Fire likely provided scarification needed for germination.

Black Locust - There are five known sites of black locust on the Refuge, with two sites complicated by adjacent, cloning populations on private property. Staff and volunteers have been especially concentrating efforts on areas with relatively fewer trees in order to gain control on at least three of the five populations. This species spreads aggressively by root and can overtake an area in only a few years if left uncontrolled. Efforts seem to be paying off, with fewer trees appearing in treated areas than in past years.

This year, many hours were spent cutting and chemically treating black locust saplings around the Prairie Learning Center and on Thorn Valley Oak Savanna. After cutting, stumps were treated with Garlon 3A to prevent regeneration of the trees.

Photo 29 – Irises grow profusely in wastewater wetland

Photo 30 – Removing brush and helping to release the prairie within

Photo 31 – “That’s Hot!”

Photo 32 – Highpoint Unit Prescribed Burn

Photo 33 – Engine detail at Square Fire in Utah

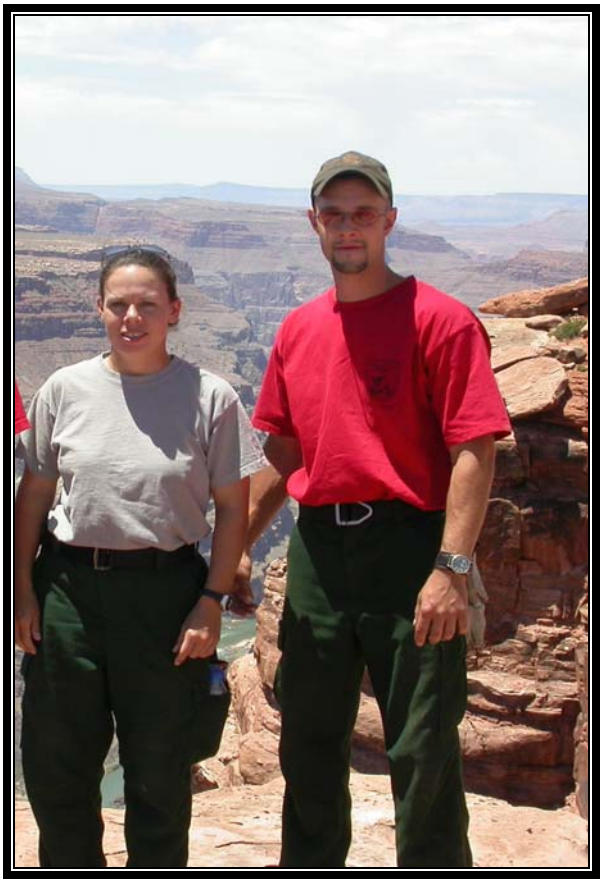

Photo 34 – Fire Techs Kim Latcham (L) and Jeff Braun on wildfire detail

4

Fish and Wildlife Management

4.a. Bird Banding

Nothing to Report

4.b. Disease Monitoring and Treatment

The Service is stepping up its monitoring of Chronic Wasting Disease (CWD) in Cervids, and as such, provided funding to develop a monitoring program on refuges. In Region 3, Neal Smith NWR was one of those refuges. Funding was provided in FY 2004 to assist in preparing the CWD plan and replacing the water gaps in the bison/elk enclosure.

The Iowa Department of Natural Resources oversees CWD issues in deer for the State of Iowa. Because elk were extirpated from Iowa and are no longer considered "game" animals, elk herds are monitored by the Department of Agriculture as farmed animals. The CWD plan will address monitoring of the elk herd, disposal of excess animals, testing for diseases, and response in case of disease.

4.c. Reintroductions

The Refuge went into the fall and winter with 41 head of bison and 30 head of elk. Surveys of both herds were conducted twice a week to monitor the general health and well being of the animals. In December a visitor witnessed an injured bull bison, at which time Krueger investigated and found that the bull had suffered an injured left hind leg. The decision was made to let nature take its course and keep an eye on the bull to see if his condition worsened. As the months progressed, the bull started to put more pressure on the leg, however, to this day he still favors the leg and walks with a limp.

One cow was looking very thin. Apparently she became trapped in the mud of the creek and succumbed to exhaustion of struggling to get free. She was discovered by staff several days later. A necropsy performed on the cow showed that she had suffered from pneumonia as a calf and currently had intestinal parasites.

The bison herd grew by seven during the spring and early summer with the arrival of the calves. All the calves grew fast and strong and continue to thrive in the herd. The elk herd grew by four; one cow appeared to have had twins. The mature bull elk grew impressive sets of antlers to prepare them for the fall mating season. Both herds made it through the heat of the summer unscathed, and seemed to relish in the cooler days of fall. Preparations were made in late summer for a bison round-up, at which time we will attempt to reduce the herd by 15 bulls (photo 35).

A bison round-up was conducted on the second of November with 23 bison captured. The purpose of the round-+up was to cull 10 bulls from the herd to ensure the correct stocking rates were within acceptable limits. The remaining animals were processed through the facility and released. Eight bulls ranging in age from two years to six years were retained in the facility. We had ten, but two escaped back into the field. The eight remaining bulls were fed hay and given water for the night. The next day, representatives of the Santee-Sioux Nation of Nebraska arrived to pick up two yearlings and a five year old. Two days later, representatives

of the Ho-Chunk Nation of Wisconsin picked up the remaining bulls. Overall, the bison looked to be in fair to good condition with some bulls in excellent condition. The round-up was completed with very few people and without the added expense of assistance from other refuges.

The bison and elk herds are on a continuous grazing regime which is estimated to produce approximately 1,125,000 to 1,500,000 pounds of forage annually. The newly established prairie within the enclosure is capable of sustaining the current herd size at a 35 to 40% utilization rate, with a 30% slope correction. Bison herd reductions will be made each year as needed to prevent habitat damage while allowing the bison to continue to play a vital role in the establishment and ecology of the prairie (photo 36).

Prairie Chicken Reintroduction Feasibility Report

An investigation of the feasibility of reintroducing the Greater Prairie Chicken culminated in a report which carefully examined literature pertinent to the Neal Smith NWR. While the plan is to reintroduce the birds at some point in the future, it is not currently appropriate, according to the literature. Several reasons exist for this decision including too many roads, fences, trees, and not enough contiguous land.

However, future reintroduction is possible with some long-term preparations. That preparation includes continued intensive tree removal in appropriate areas, removal of fences, removal of unused roads, and acquisition of land especially in areas where bison and elk range are scheduled to be expanded, as grazing can be important in development of prairie chicken habitat. In addition, monitoring, planning and partnership development need to occur.

Development of partnerships with Refuge neighbors in prairie chicken introduction is critical, as prairie chickens may not stay within Refuge boundaries. Local education, outreach, and partnership programs need to be developed to draw stakeholders to the table in advance of prairie chicken introduction to maximize success.

Action should be taken to begin planning for prairie chicken reintroduction by developing a habitat monitoring phase as a part of the overall NSM Habitat Management Plan. Discussion among conservation organizations to develop a state-wide landscape plan for prairie chicken recovery in Iowa should begin; this document could help in beginning the dialogue. Prairie chickens are adaptable animals and with appropriate timing of introduction relative to educational and outreach efforts, Refuge ecological development, and partnership development, introduction is likely to be successful.

4.d. Nest Structures

Nothing to Report

4.e. Pest, Predator and Exotic Animal Control

Nothing to Report

Photo 35 – Let sleeping bison lie

Photo 36 – Monarch of the prairie

5

Coordination Activities

5.a. Interagency Coordination

Drobney met with a group of Des Moines city employees engaged in developing prairie plantings on school yards and city parks. Former NSM intern and undergraduate researcher, Laura Elliot, now with the Des Moines Botanical Garden, is spearheading development of an effort to develop prairie plantings in public areas in Des Moines. Drobney provided training and guidance in developing seed prescriptions.

On November 6, Drobney provided external review to the Chichaqua Advisory Board about the ecological significance and about restoration/reconstruction progress of Chichaqua, a river restoration project. Information from this review will be presented to the Polk County Conservation Board to support ecological management at Chichaqua.

Drobney, a member of Iowa Invasive Species Committee, attended an Exotic and Invasive Species Workshop at Jester Park in Polk County. The purpose of the meeting was to develop networking involving invasive species, to build a stronger coalition to prevent invasion, and to control current invasive species in Iowa.

Neal Smith NWR hosted 70 representatives from the NWCG Eastern Area Coordination Center for a two hour tour and a discussion of prescribed fire objectives and activities in prairie and savanna ecological restorations. The tour was a part of a meeting held in Iowa.

Both the Prairie City Business Development Committee and the Economic Development Committee are interested in partnering with the Refuge on enhancing marketing efforts in the town. The possibility of developing a plan/project which would qualify for state TEA money was discussed. A joint meeting of the groups and the Refuge on January 12 further explored this possibility.

Throughout the months of January and February, Refuge staff members attended various meetings with the City of Prairie City officials and numerous other citizens and representatives from other agencies. The focus of their time and effort: piecing together a TEA Grant proposal for submittal at the end of the year. Everyone involved in the visioning process identified five main projects that they would like to place forward for consideration of funding: a city entry plaza with information kiosk, a multi-purpose recreational trail connecting the city with the Refuge, prairie icons placed throughout the town and prairie-themed murals painted on selected business buildings.

Grant applications were due to the State of Iowa on October 1. Working closely with the city administrator, Ford helped to prepare the proposal and presented it to the city council at a special meeting on August 25. After some discussion and questions, the council unanimously approved to support the grant application as written. They passed a resolution at their regular September meeting which binds them as the administrators of this project and any monies received for the next 20 years. The council was very complimentary of the partnership effort between Refuge staff and the city. In total, the amount of funding assistance requested for the project was nearly $650,000 (photo 37).

5.b. Tribal Coordination

Ford accepted an invitation from the Meskwaki tribe to attend their annual Powwow on August 6th. Ford met with the tribal historian, Johnathan Buffalo, and together they talked about many things relating to how the tribe and the Refuge could partner and add value to our existing programs. The tribe is looking to start a buffalo herd on their rather expansive land holding in Tama County. The Refuge would like to have the tribe display information and conduct special interpretive programs during Buffalo Day, 2005. The possibility also exists of inviting tribal individuals to sell native food items to the public as part of the event. There may be other ways in which we can work with the tribe, and the dialogue is continuing.

Gilbertson worked with Regional Office Native American Liaison, John Leonard, to donate excess bison to the Santee Sioux and the Ho-Chunk Nations (see section 3c).

5.c. Private Land Activities

This year's Partners program was very active. Fourteen agreements were signed and over 270 acres of prairie were restored. Two wetlands, totaling approximately 17 acres, were restored. The bulk of this year's private lands' activities was spent helping landowners with technical assistance. Approximately 57 landowners called or had appointments to have their property reviewed. Though most were unable to enter into an agreement, all were very satisfied with the biological advice and were happy with the visit.

This year was the first for Rich and Below to inspect the FMHA easements. For the most part, the easements were intact. There were some problems and many were in dire need of management, but the majority was functioning as the easement intended. Mainly signs and seed were needed to improve these areas. One landowner was warned to remove equipment stored on the property and he was polite and advised us that it would be taken care of.

Photo 37 – Prairie City Business Association members get a tour of the maintenance facility

6

Resource Protection

6.a. Law Enforcement

FY 2004 was a busy year for law enforcement. Twenty-one citations and five warnings were issued for possession of lead shot while hunting. Twelve parking violations were issued along with 26 warnings of parking in field entrances. Hunters hunting without blaze orange are still a problem with seven citations written; one person was caught hunting in a closed area, and two hunters accessed the Refuge early. Twenty-six warnings were issued for the following reasons: hunting in a closed spring turkey season, illegally training dogs on the Refuge, illegally collecting fall mushrooms, and running a stop sign.

Five investigations occurred this year. The first was a case of two truckloads of garbage dumped on the southern section of the Refuge. A suspect was found and the garbage cleaned up. The second investigation dealt with unauthorized burning on a field entrance along 119th. A stakeout was set up and the violator was apprehended. Jasper County Sheriff and Prairie City Police assisted and pressed additional charges for driving restrictions. The suspect also had an arrest warrant in Colorado. The third investigation was a chemical runoff onto the Refuge, but no charges were filed. Special Agent Justin Mays and the Iowa DNR assisted in the case. The fourth case was an ongoing case of meth lab dumping on the Refuge and the lands surrounding it. Nine labs were dumped on the Refuge with many more to the south. The Jasper County Drug Task Force caught three of four individuals making meth less than ¼ mile from the Refuge boundary. The final investigation involved a hunter reported being shot while hunting. Officer Rod Hansen and Officer Below investigated the accident. The hunter had been sprayed with shot, and no injury was involved.

Five traffic incidents occurred on the Refuge. Four automobile accidents resulted in tow service assistance. Three of the four accidents were a result of drivers watching wildlife and driving off the road. A citation was issued for the fourth incident for driving off the road. A camper fire was put out by the owner and Officer Below, thanks to a local visitor who reported the fire. The family was able to continue their trip with just a short delay and minor damage (photo 38 and photo 39).

Officer Below participated in two details this year. One was assisting Homeland Security at Mount Rushmore during the 4th of July weekend and the other was to provide security assistance for the Florida hurricane aftermath.

6.b. Permits and Economic Use Management

Special Use Permits were issued authorizing collection of firewood to four individuals, one for removal of willows, two for removal of old wire fencing material and wood posts and one to collect foundation debris.

Six permits were issued to local farmers to allow for cropping privileges. These agreements provided agricultural rental on approximately 885 acres of Refuge land to seven farmers during 2004. Agricultural lands are kept in crops until the Refuge is ready to convert them to prairie. The farming program was designed to allow the permittee a reasonable rent on the land while giving the government a reasonable return. Permittees were required to meet special

conditions which include using no-till farming practices, no fertilizer applications in the fall, limited herbicide options and other conservation friendly restrictions. Rents ranged from $75 to $90 per acre depending on the quality of soils and past crop yields. Rental rates were comparable to those collected in the area for similar ground according to the ISU Extension Office. Rent was collected in two installments with 30% due in May, and the balance due in December. Final rent totals are based on the Report of Planted Acres which each permittee submits to the Farm Services Agency (FSA). Rent collected in 2004 will exceed $60,000. Success of this program has been very good, giving both the Refuge and the farm operators a good value while meeting land management objectives. In 2004 approximately 250 acres will be retired from the farming program and planted to prairie.

A permit was issued to Walt Sadinski, Upper Midwest Environmental Sciences Center, La Crosse, Wisconsin to conduct a preliminary study of reptiles and amphibians from March through October.

Steve Hummel of Lake View, Iowa was issued a permit to conduct a study of Odanta (dragonflies & damselflies) on Refuge property from April through December 31, 2004.

Moth sampling was approved for Dr. Keith Summerville, Drake University Professor, during the period May through October.

Robert Woodward, Altoona, Iowa received a permit to count monarch eggs, caterpillars and butterflies to compare plant use among species and to evaluate population size on six areas of the Refuge from June through October.

A permit for water sampling using a Cornell Sprinkler to investigate infiltration rates and determine the bulk density of various prairie sites was issued to Dr. Mahdi Al-Kaisi and Mark Licht, from Iowa State University. This sampling began in July and will continue through December 2004.

Iowa DNR Research Scientist, Dr. Keith Schilling was given a permit to perform hydrological research on several sites from July through December.

Dr Heidi Asbjornsen was given permission to research savanna restoration following details in her proposal entitled “Restoring native savanna ecosystems in the prairie-forest transition zone of Iowa.”

Soil research was conducted by Cynthia Cambardella and Mark Tomer with a special use permit issued in August. These individuals are employed by the National Soil Tilth Lab, USDA.

Dr. Steve Spangler from Clive, Iowa was given permission to perform preliminary sampling during September and October on four sites to provide information about ecological restoration on the Refuge.

A right-of-way easement was issued from the Regional Office to the Iowa Rural Water Association to run a new water line along the north side of Highway 163.

A Compatibility Determination was completed and an easement was issued to the National Oceanic and Atmospheric Administration (NOAA) to install a Climate Reference Network weather data station. This station will provide climatological data for NOAA for the next 100 years.

The U.S. **Climate Reference Network** (USCRN) is a network of climate stations now being developed as part of a National Oceanic and Atmospheric Administration (NOAA) initiative. Its primary goal is to provide future long-term homogeneous observations of temperature and precipitation that can be coupled to long-term historical observations for the detection and attribution of present and future climate change. Data from the USCRN will be used in operational climate monitoring activities and for placing current climate anomalies into an historical perspective. The USCRN will also provide the United States with a reference network that meets the requirements of the Global Climate Observing System (GCOS). If fully implemented, the network will consist of about 110 stations nationwide. Implementation of the USCRN is contingent on the availability of funding (photo 40).

6.c. Contaminant Investigation

Nothing to Report

6.d. Contaminant Cleanup

Nothing to Report

6.e. Water Rights Management

Nothing to Report

6.f. Cultural Resource Management

Nothing to Report

6.g. Land Acquisition Support

Realty appraised one piece of property and made an offer to the landowner. The offer was lower than expected and was rejected. The photograph map shows the latest FWS lands totaling 5,366 acres (map photo 41).

6.h. Threats and Conflicts

Nothing to Report

Photo 38 – “Keep your mind on your driving…”

Photo 39 – “Keep your hands on the wheel…”

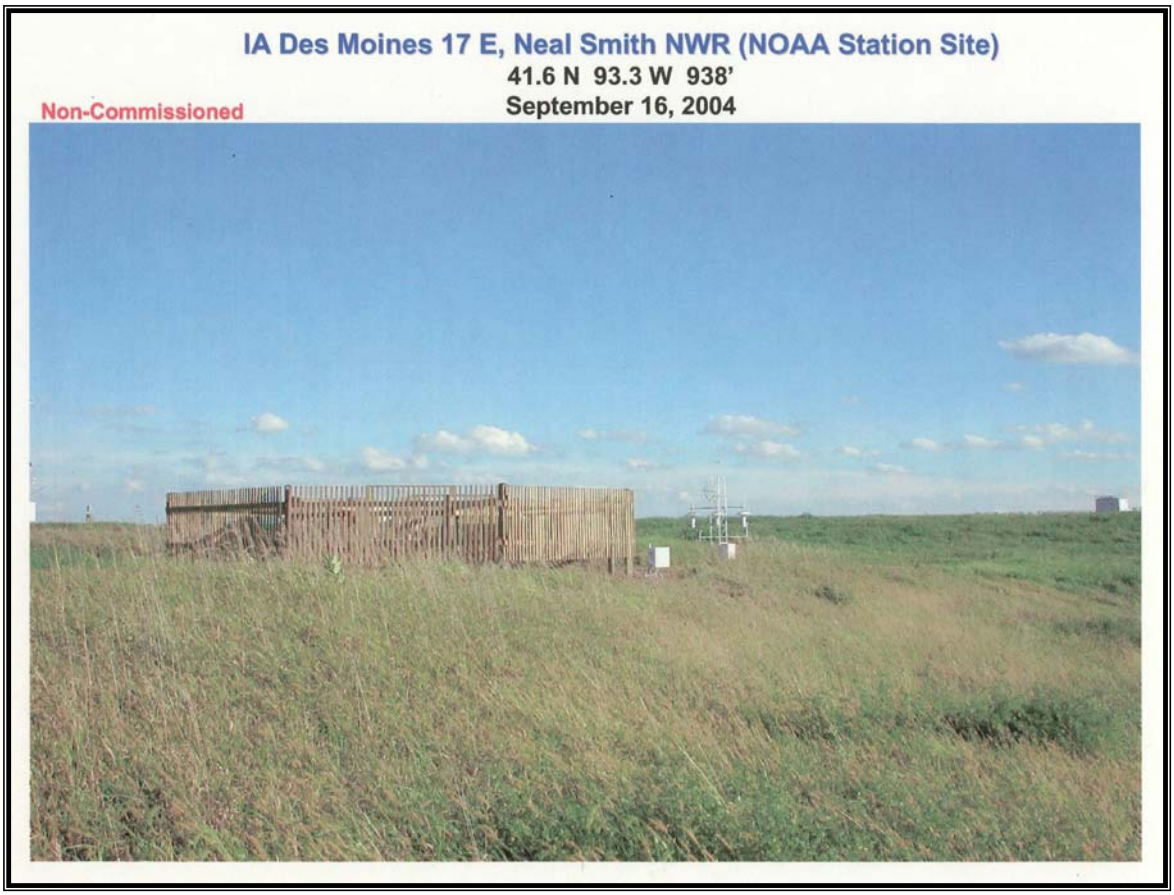

Photo 40 – USCRN site at the Refuge

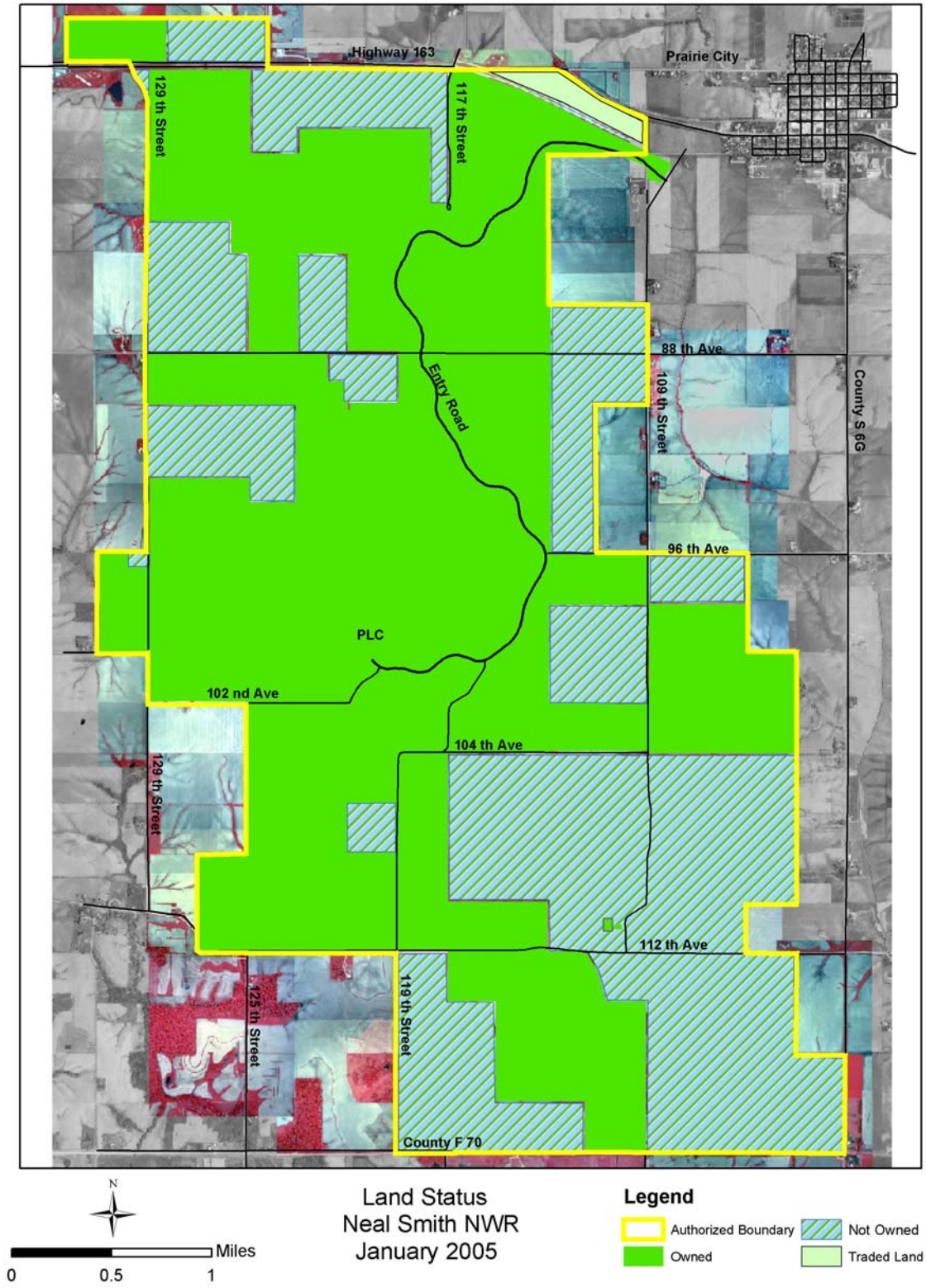

Photo 41 – Updated Refuge Ownership Map

7

Public Education and Recreation

7.a. Provide Visitor Services

The Refuge received 156,037 station visits during the period October 1, 2003 through September 30, 2004, which is very consistent with visitation recorded from the previous few years. This was neither a drought or flood year, and weather was seasonally average for the most part. It's difficult to know for certain, but we feel that weather had little or no adverse impact on visitation. General attendance at the Prairie Learning Center was 19,228 and was also very much aligned with the total visitation from the previous year. Approximately 10,632 school children came through the Center as participants in class field trip activities, while another 56,033 people took advantage of the Auto Tour Route. More than 13,600 folks enjoyed general wildlife observation activities.

Five of the "Big Six" wildlife dependent recreational opportunities were offered on the Refuge: hunting, wildlife observation, photography, along with environmental education, and interpretation.

NEW FACES

Anna McDonald was brought on board as a STEP student in December. She is currently a junior at Iowa State University (photo 42).

After working shorthanded for most of 2003, the Public Use staff was once again at full-strength beginning November 17. On that date, the vacant Supervisory Park Ranger position was filled by Scott Ford, who was previously serving the National Wildlife Refuge System at Minnesota Valley NWR, in Bloomington, Minnesota. Ford is a native Iowan, has a B.A. degree in Journalism, and is thrilled to be a part of the Neal Smith team.

WILDLIFE OBSERVATION & PHOTOGRAPHY

Art Gallery Upgrade

Several fine artists displayed nature-related photography and exhibits in the J.N "Ding" Darling Art Gallery in 2004. Of special note were: Robert Sissel, Russ Duerksen, Buzz Balzer, and Doug Davis.

The art show "Wild Imagination" by South Dakota artist Russ Duerksen ended on August 31 with nearly $1,000 in sales conducted. A portion of those sales receipts came back to the Friends of the Prairie Learning Center in consideration for hosting the show. The artist was very pleased with the results, and is looking forward to another show in 2006. Duerksen would like to display again sooner, but no gallery time is available. The Refuge has received a great deal of interest in the gallery from the local art community and as a result of that interest, the gallery currently is reserved through late 2006 (photo 43).

Environmental Education & Interpretation

FY 2004 – EE BY THE NUMBERS

- Programs Provided: **1,262**
- Program Participants: **18,244**
- EE Outreach (off-site) **468**
- Education Outreach **39,427**

- Nature Trail Use: **94,745**
- Auto Tour Use: **56,033**

Hollerich received a nice accolade from the State of Iowa. On April 27th, she received an "Above and Beyond" recognition award, which was presented to her in a formal ceremony by Iowa Governor Thomas Vilsack at the State Historical Building. Hollerich was selected for the honor because of her demonstrated outstanding service to Iowa children through raising environmental awareness and promoting environmental projects among young people (photo 44).

The long awaited and much anticipated Prairie Plant Wheels arrived from the local printer thanks to the generous support of the Friends of the Prairie Learning Center who provided funding for the wheels. The wheels are a great complement to the newly updated Project Bluestem (PBS) curriculum CD, and the two items were immediately placed for sale in the Prairie Point Bookstore for $25 per set. To date, the Bookstore has sold more than 200 copies of Project Bluestem (photo 45).

PBS went "nation-wide" in January when an all-employee email note went out offering the CD's and Plant ID Wheels for sale to anyone interested. So far, over 50 copies of Project Bluestem have been sold to other refuge stations, and orders are still coming in. The Refuge worked closely with the University of Minnesota Extension Office to conduct workshops in Minnesota for Neal Smith NWR.

7.b. Outreach

The Friends of the Prairie Learning Center received a Nature of Learning Grant which provided funding to work with a local school to establish and monitor a prairie over time. Hollerich attended a question and answer session at Lynnville-Sully High School and attempted to help the students with the creation of a schoolyard habitat. Hollerich worked with Mike Rich on getting seed for one-half acre for use by the school. Hollerich and Drobney visited the school again and an area was selected to help them start their own prairie. Refuge staff provided assistance in all phases of the prairie reconstruction and they are very pleased with the results thus far.

Shea traveled to northeast Illinois to give an overview of Neal Smith NWR operations for the U.S. Forest Service at the Medeowin Prairie, a new multi-purpose natural area, formerly an army munitions location. His new presentation has ongoing applicability to any staff member who provides off-site Refuge programs, and was used several times during the year.

Public use staff traveled to Union Slough NWR and spoke to school groups in Algona and Titonka, Iowa. Since Union Slough has no staff dedicated to outreach or environmental education programming, we may look to provide future opportunities for the communities surrounding the Refuge.

The library is now entering the final stages of renovation. The space was officially named "Prairie Passages" after input from all staff was received and considered. From this point forward, the Neal Smith Library will be referred to as Prairie Passages.

Staff and multiple volunteers were busy most of the summer getting Prairie Passages up and running. So far, about 1,200 books and videos have been entered into the database, which comprises approximately 95% our collection. One copy of each book available in the Prairie Point Bookstore was placed in Prairie Passages. Thanks to the Friends for donating the books, additional funds and time which has made the renovation a reality (photo 46).

Continuously through the year, Al Murray was very busy coordinating bi-weekly stewardship activities and providing EE programs. Ames schools were Al's main focus early in the fiscal year with the kids providing the muscle to clean more than 15,000 conetainers in preparation for the next growing season. Al's good work with Refuge stewardship efforts kept hundreds of school children and volunteers busy doing work that otherwise might not get accomplished (photo 47 and photo 48).

Technology Upgrade

Gilbertson and Ford met with Brackett Media to begin the process of transferring the movie, "Return to Wildness" from its laser disc format to DVD. Laser disc players are no longer being produced. So, in the event that the players would need to be replaced, the Refuge movie would no longer be viewable - hence our move to the DVD format.

Another problem was that our video projectors were obsolete. The bulbs (lamps) are no longer being produced and in response to that, last year new projectors were purchased. Ford continued to work on finding the lowest bid for installing the recently purchased DVD players and new projectors. The computer system which runs the show needed to be reprogrammed too, and as we learned, that was no small task. Progress was slowed by the inability of the programmers to interpret the digital computer "code" of the previous laser disk show format. However, they eventually cracked that code and continued on with installation. The show was once again on-line, and in time for the fall 2004 school season.

SPECIAL EVENTS

"Ding" Darling Day

Murray coordinated the kick-off of two Eagle Scout projects involving large scale tree and brush removal from designated sites. He also facilitated the "Ding" Darling Day special event on October 9. Over 150 people attended and cleared brush, picked up litter and removed fence lines. Lunch was served afterward. Murray also continues to do scout badge programs on Saturdays (photos 49 – 53).

Cabin Fever Day
The annual "Cabin Fever" event was held on Saturday, February 7 in the Prairie Learning Center. It was a cold and snow day. Our theme was "Celebrating a Century of Conservation" and the signature event of the day was the dedication of the Refuge centennial time capsule.

Partners helping celebrate the event by hosting craft and information booths included the Isaac Walton League, Ducks Unlimited, and Des Moines Woodcarvers. Volunteer, Dave Wharff, was on hand to provide some spellbinding storytelling, and Joe Nobiling, along with son Josh, provided some down home fiddle and guitar entertainment. They even taught the assembled crowd how to dance the Virginia Rail. It was quite a festive atmosphere.

A highlight of the day included Ford and Gilbertson dedicating the centennial time capsule. After a brief talk with the group, Gilbertson invited several children in the crowd to finalize the moment by helping fill and seal the capsule. A beautiful, specially made case was crafted by volunteer Bob Buyert, which holds the capsule in place and displays it for all to see in the entryway to the Prairie Learning Center (photo 54 and photo 55).

Earth Day
On Saturday, April 17, staff and volunteers at Neal Smith National Wildlife Refuge held a special event to commemorate Earth Day 2004. The focus of activities for the day was stewardship, with the set-up being modeled similar to the previously successful J.N "Ding" Darling Day, held in October of last year.

The objective of the event was to provide a stewardship opportunity for groups and individuals who were looking for ways to be involved with the Refuge. With this objective in mind, during December an effort was made to reach a wide variety of groups. Direct mailings were sent to the Mid-Iowa Boy Scouts of America (who subsequently posted Earth Day event information on their websites). Information was also posted on the Friends of the Prairie Learning Center website and on the Iowa Prairie Rescue board as well as with AmeriCorp coordinators. All groups who had made a past inquiry regarding stewardship opportunities were notified of the event. Additionally, any groups we have conducted outreach programs were also notified. Approximately 180 volunteers participated in the day.

Project site work was coordinated and supervised by Refuge staff members. After staging in the Prairie Learning Center, volunteers were introduced to their site leaders, received a brief area orientation and safety talk, and then dispersed to the six individual stewardship sites.

All crews worked from 9 a.m. until noon, and then returned to the Prairie Learning Center for lunch, which was provided by the Friends. Third Congressional District Representative Leonard Boswell stopped in at noon to review all of the good work being done and to offer his ongoing thanks and support to both the volunteers and to the Refuge (photo 56).

Home and Garden Show
Staff and volunteers staffed a booth at the Home and Garden Show from the 18th of March through the 21st at the Varied Industries Building on the Iowa State Fairgrounds in Des Moines. The Public Use staff prepared a "Planting with the Natives" display. Hundreds of personal contacts were made during this event.

International Migratory Bird Day
The Public Use focus event for May was International Migratory Bird Day (IMBD). Sara Hollerich coordinated the effort, held on May 8 and 9 from 9:00 to 4:00 both days. This year's theme was "Birds, Bats and Butterflies"…because birds aren't the only international migratory animals! Live bird, bat, and butterfly presenters were on hand to answer questions posed by the public and to conduct live animal demonstrations. The programs were a huge success. Besides the programs, volunteers and staff members conducted bird hikes, painted children's faces, talked about the "Anabat" technology (identifies bats by sound), handed out door prizes, and served a free lunch (provided by the Friends of the Prairie Learning Center). Krueger performed as "Puddles, the Blue Goose" and posed for photos and received hugs from kids and adults alike.

As part of the IMBD event, Doreen Van Ryswyk and Gary Shea presented the Iowa Jr. Duck Stamp Award Ceremony which took place on May 8 at 10:30 a.m. Rick Hager coordinated with the Friends of PLC the second annual "Wild Things" wildlife and nature art show and sale with nine artists participating, generating over $7,000 in sales. All told, attendance for IMBD reached almost 700 visitors and nearly $2,000 was generated in donations and art show proceeds for the Friends.

Buffalo Day/Prairie Days
For the past seven years, one Saturday in June has been designated and celebrated as "Buffalo Day" at Neal Smith National Wildlife Refuge. In 2004 this signature annual event was held June 26 on a glorious early summer day. The fun ran from 10:00 a.m. to 3:00 p.m. at the Prairie Learning Center.

Each year, Refuge staff hosts special programs and activities on Buffalo Day to highlight and honor the majestic creatures that once freely roamed our prairies by the tens of thousands. The day also commemorates the important role that bison played in the daily lives of Native Americans and early European settlers. Nearly 700 individuals took advantage of near-perfect weather conditions to partake of the festivities. The first 500 visitors even received a free buffalo nickel, courtesy of the Friends of the Prairie Learning Center.

Many in attendance took the opportunity to combine the activities at Buffalo Day with a drive through the bison enclosure to view our herd of buffalo and elk. Arts and crafts, flint knapping, hide scraping, storytelling, nature hikes, and guest presentations were just some of the activities in which visitors participated. Spectacular wildlife art by Iowa artist Robert Sissel was on display in the "Ding" Darling Art Gallery. Native American flute music entertained and amused all ages, as did the prairie settler era folk music of Pat Walke and Mike Mumm. Once again this year a buffalo photo contest was held, and a temporary display was created with all of the pictures. For lunch, visitors could munch on buffalo burgers and hot dogs which were available through the Newton Jaycees.

In conjunction with Buffalo Day, Prairie City holds it "Prairie Days" celebration. The Refuge took third place in the annual parade (photos 57 – 59).

Junior Duck Stamp Program
There were 411 entries in the Iowa Junior Duck Stamp Contest in 2004, which was up from 287 in 2003. Iowa's Best of Show winner was Curtis Thelen, a senior from East Union High

School in Afton. The award ceremony was held in conjunction with International Migratory Bird Day on Saturday, May 8. Approximately 150 people attended the ceremony. Winners received a certificate, a ribbon, the 2003 Federal Junior Duck Stamp, and an engraved plaque that included a copy of their winning entry. The winning entries were sent to six locations around the state to be displayed (photo 60).

Gilbertson met with Marvin Campbell, coordinator for the Iowa Junior Duck Stamp/Cherkasy, Ukraine Waterbird art exchange program. This will be the fifth year that artwork from the two countries have been exchanged and displayed. Ukrainian artwork was displayed at the Refuge for the summer, then judged similar to the Iowa Junior Duck Stamp artwork, and winners were named for age groups from six to eighteen years of age. The Newton, Iowa non-profit organization, OPEN (Organization Promoting Everlasting Neighbors), provided cash awards to the winners.

Other Items Worthy Of Note

- Public Use interns Noel, Trost, and Caldwell came on board over the summer and immediately helped out wherever needed.

- On May 27, Ford and Gilbertson attended a regional "Recreational Trails Summit", held by Congressman Leonard Boswell at the Principal Financial Building in Des Moines.

- Hollerich developed a "Gardening with Natives" power point program and delivered it to the Evening Star Garden Club. Thirty-five of their members attended and voted to donate $100 to the Friends of the Prairie Learning Center to show their appreciation.

- Hollerich worked with Dee Butler of Birdscapes Magazine to prepare an article on Project Bluestem. The magazine is distributed to 76 countries around the globe.

- Murray, the Refuge CPR & AED Coordinator, contacted the Iowa Department of Health regarding obtaining a medical "prescription" for our AED. Murray was able to obtain clarification on prescription regulations. After a series of conversations with American Red Cross representatives, Murray was able to obtain the name of a referral physician to maintain as contact for "prescriptions" and use of our AED. This arrangement saved the Refuge up to $900 by not having to go through Medtronic (the maker of the AED) to obtain this prescription.

- For the year, Murray and stewardship volunteer helpers planted over 7,500 seedlings along the Overlook Trail.

- Shea installed traffic counters at five main access/entry points into the Refuge, including the auto tour route. Accurate and dependable visitation counts will now be able to be entered into the monthly RMIS database.

- On March 25 and 26 respectively, Ford and Gilbertson assisted Suzanne Baird from the Regional Office in staffing a Service booth at the annual MANRRS diversity career job fair, held this year in Des Moines.

Photo 42 – STEP MacDonald (L) shows a plant to Public Use Intern Erin Troste

Photo 43 – "Ding" Darling Art Gallery

Photo 44 – Iowa Governor Tom Vilsack presents award to Sara Hollerich

Photo 45 – Project Bluestem and new plant ID wheel are for sale in bookstore

Photo 46 – Prairie Passages library coming to fruition

Photo 47 – Eagle Project tackled trees on remnant prairie (before)

Photo 48 – Trees are removed (after)

Photo 49 – Brush and trees removed from savanna and piled for burning

Photo 50 – Mike Rich (far right) helps pull out fence

Photo 51 – Girl Scout group cleans seeds

Photo 52 – Hollerich leads Girl Scout group to pick up tons of trash

Photo 53 – Volunteers clean more seed

Photo 54 – All the items that went into the time capsule


Photo 55 – Closing the capsule. See you in 2103!

Photo 56 – Representative Leonard Boswell volunteers to plant seedlings

Photo 57 – Bluegrass music played at Buffalo Day

Photo 58 – Thanks to the Region 3 Sign Shop for printing these great signs!


Photo 59 – Float wins 3rd Place at Prairie City "Prairie Days" Parade

Photo 60 – Best of Show Iowa Junior Duck Stamp 2004

8

Planning and Administration

8.a. Comprehensive Conservation Planning

Nothing to Report

8.b. General Administration

Refuge Funding

Fund	FY 2004	FY 2003	FY 2002	FY 2001	FY 2000
1261	1,024,443	1,044,702	916,054	845,369	804,702
1261 (VOL)	5,000	5,000	8,000	7,000	4,900
1261 (LE)				500	
1262	244,622	103,288	483,164	30,000	80,000
1121	6,000	6,000	7,000	7,000	7,000
1230/1231				1,000	
9110/9251		5,000	13,629	3,000	5,400
9131	5,942				
9263	79,839	63,235	17,734	15,522	10,659
9264			7,500		
TOTAL		1,227,225	1,453,081	909,391	912,661

Base salary funds totaled $894,664 (16.5 FTE's) with $46,479 in RONS Invasive Species Project dollars added for salary funding of a Bio Tech position originally funded as a RONS FTE. Operating expense money included $83,300 base funds and $5,000 for our volunteer program. The station received $10,000 for chronic waste disease research purposes.

Items and/or services procured during the period worth noting include:

- A Merlin Magix Telephone System to replace an outdated Merlin Legend System.
- A 20' John Deere mower, trading in an Alamo mower.
- Installation of nine water gaps in the bison enclosure. Materials were purchased in preparation for the fall bison round-up.
- Replacement computer for a Windows NT computer which was utilized as a back-up GIS station along with two computers purchased with SAMMS funding.
- DVD players to replace outdated video players used in the Visitor Center.
- Carpeting for the Ding Darling Art Gallery walls.
- Computer tables for the library.
- Tracked lights for the Ding Darling Art Gallery
- Industrial Vacuum Sweeper
- Security system
- Alarm receiver installed in the Jasper County Law Center for the Refuge's security system
- Ice Maker
- Rental of motor grader for two months
- 2005 Ford Explorer and 2005 K0002 Hybrid Pick-Up

Annual MMS funding totaled $45,000. We received $83,500 for a new security system; $50,810 to replace two vehicles, one replacement was a hybrid vehicle; $10,000 to rent a motor grader, $20,000 for SAMMS implementation; $17,000 for a new Alamo Mower and gravel and $10,586 for YCC conservation projects.

Refuge Staffing

Below is a list of employees who were members of the staff at Neal Smith NWR during FY 2004:

Permanent Full Time	Grade	OD Date
Gilbertson, Nancy M. Refuge Manager	GS-13	09/98
Drobney, Pauline M. Wildlife Biologist	GS-12	03/92
Ford, Scott R. Park Ranger	GS-12	11/03
Rich, Michael Y Refuge Operations Specialist	GS-12	10/03
Boot, Brian A. Maintenance Mechanic	WG-9	10/92
Below, John J. Park Ranger (Volunteer Coord.)	GS-9	04/98
Shea, Gary L. Park Ranger	GS-9	05/02
Severson, Terry Prescribed Fire Specialist	GS-9	06/03
Hollerich, Sara Park Ranger	GS-7	09/02
Krueger, Jeffrey Bio Science Technician	GS-5	06/03
Dykstra, Carla J. Administrative Technician	GS-7	05/91
Murray, Allan A. Park Ranger	GS-7	05/02
Hager, Richard C. Bio Science Tech (Wildlife)	GS-6	06/02
Stapleton, Glenn S. Maintenance Worker	WG-5	08/02
Van Ryswyk, Doreen D. Secretary (OA)	GS-5	08/97
Temporary Employees		
Braun, Jeffrey Range Technician	GS-5	04/03
Latcham, Kimberly R. Range Technician	GS-4	03/04

Student Temporary Experience Program		
Allen, Nicholas	GS-3	06/04
Bio Science Aid		
Bruns, Kelsey	GS-2	06/04
Bio Science Aid		
MacDonald, Anna	GS-3	12/03
Information Receptionist		
Van Ryswyk, Scott A.	GS-4	06/01
Bio Science Technician		
Van Zee, Eric	GS-4	06/01
Bio Science Technician		Terminated 05/04

As each year passes, staff changes remain constant (photo 61). Michael Rich began duties as the Refuge Operations Specialist on October 19. Mike was an employee of the Iowa Private Lands Office before joining the Neal Smith NWR staff. Scott Ford transferred to Neal Smith NWR from Minnesota Valley NWR in November 2003. Scott took over as senior park ranger and is overseeing our public use program. Anna MacDonald was welcomed by the public use staff on December 15, 2003 as a STEP employee. Anna is currently a student at Iowa State University. Kim Latcham began work on March 8 as a temporary range technician. Kim is also a member of the Iowa Air National Guard. STEP Eric Van Zee graduated from college in May and left the station to pursue full time employment. Nick Allen joined the staff as a STEP employee on June 1. Both Biology and Operations' staff utilize Nick's skills. Nick is a student at Des Moines Area Community College. Kelsey Bruns came on board on June 14, also participating in the STEP. Kelsey graduated from Newton High School in May and began her college career at the University of Iowa in August. Kelsey is assisting the Operations' staff.

2004 YCC Program

The 2004 Youth Conservation Corps program at Neal Smith National Wildlife Refuge accomplished many important tasks during the eight-week period. In return for employment in the environmental field, work that is not commonly available to high school students, the enrollees provided a resource that saved the Refuge time and money.

The enrollees were recruited from four area high schools. Two females and two males were selected from a pool of fourteen applicants. All four successfully completed the eight-week program.

The total cost of the program was $18,404. Enrollees' salaries totaled $6,705. Staff salaries were $9,975. Material costs for projects were $1,724. However, additional materials ($3,790) purchased last year for the butterfly garden project were used this year. The cost of the program decreased from the previous year because of the materials on hand.

The enrollees participating in this year's program each offered different skill sets and attitudes that contributed benefits for both the crew and the Refuge. The enrollees learned several new skills and accomplished many tasks. By challenging themselves and being challenged by the program, they left with greater confidence and a strengthening of their skills with an improved work ethic. They gained insight into conservation, their environment, plant identification, native/non-native plant ecology, and prairie reconstruction, as well as job planning, light construction, teamwork and safety.

Response from the enrollees was favorable. All replied that they gained a useful knowledge of conservation, environmental issues and plant ecology from information integrated into the projects in which they were involved. A field trip to the University Of Iowa Museum Of Natural History, The Devonian Fossil Gorge, McBride Raptor Center, Mahaffey Bridge Natural Area and the CERA Prairie broadened their perspectives. One enrollee is considering furthering his education in environmental studies. The group demonstrated a great capacity to learn the job quickly and many times suggested new ways to complete the project. The group was disappointed in the rate of pay for the hard labor that was performed and all thought the wage should be higher.

There were more projects proposed for the eight-week term than could be accomplished by the crew of four. In addition, priority projects happened during the course of the summer which delayed some planned projects and prevented the finishing of others. The enrollees did accomplish a tremendous amount of work. The crew built a butterfly garden with 1100 square foot brick walkway, benches, rock wall, boulder and a "puddle" for the butterflies to drink from; cleared approximately three miles of fence; surfaced part of a public use trail with wood chips and built a boardwalk over a wet area; cleared invasive species from prairie plantings and planted seedlings; harvested seed; removed non-native plants from future harvest sites; and cleared brush and trees from prairie remnants, plantings and fence lines. They also aided in the maintenance of the Refuge by litter removal, cleaning offices, washing vehicles and cleaning storage areas and sheds (photos 62 – 66).

Volunteer Program

Volunteers donated over 23,000 hours in FY 2004, most of their efforts concentrated on upland restoration with over 11,000 hours and visitor services with over 9,100 hours. Over 1,700 hours were captured under outreach. They dedicated 400 hours to mowing and an additional 400 hours went to helping with fire activities. Volunteers also helped with studies and investigations for another 400 hours. This year, 228 volunteers worked at least once with 23 volunteers each putting in over 200 hours. Two big events helped bring in a large number of volunteers and groups. Al Murray led two large stewardship days, "Ding" Darling Day in October and Earth Day in April. Both events had close to 200 volunteers, each providing approximately four hours each. Al, with the help of staff and other volunteers, pulled out fence, cleaned the road ditches, cut out unwanted brush and collected and cleaned seeds. The bookstore volunteers also generate a large number of the volunteer hours. The volunteers greet visitors, start the movie, clean seeds, make announcements, and help run the Prairie Point Bookstore. The 33 bookstore workers donated over 6,500 hours working in the bookstore and helping with several other projects (photo 67 and photo 68).

Our first recognition event for FY 2004 was a bus trip to Squaw Creek NWR in northwest Missouri. These trips help educate the volunteers about the refuge system and offer the opportunity to visit other refuges. This was the fourth refuge we have visited in four years. The volunteers had an excellent time and were greeted by the Friends of Squaw Creek and their staff.

Our volunteer recognition dinner served over 105 individuals, several of the Refuge staff was on hand to serve the meal and show their thanks to all the volunteers in attendance. The awards and dinner were well appreciated. Some of the major accomplishments of the volunteers:

- 1,000 Hour Recipients: Mary and Robert Swan, Mary Moore, Kathryn Van Zee, and Dawn Neff.

- 2,000 Hour Recipients: Dave Wharff, Erma Selser, Dan Fenimore, and Eugene Brown.

- We had 11 new volunteers who worked at least 50 hours and were eligible to be nominated for Outstanding New Volunteer. Ted Huisman was a unanimous choice by volunteering over 200 hours in his first year. Ted did a variety of odd jobs for the Refuge such as painting, environmental education, seed collection and cleaning and helping with fire traffic control.

- Twenty-three volunteers received the certificate of excellence, (which requires over 200 hours of service in the past FY). These volunteers are voted on by staff for Volunteer of the Year.

This year we had a tie for Volunteer of the Year. Warren Burman, a faithful volunteer came in five times a week to clean seeds, and always had a joke ready, donated over 450 hours in FY 2004 and was voted co-volunteer of the year. Mary Moore was the other co-volunteer of the year. She is the first two-time winner and has won it back-to-back. Mary contributed over 1,000 hours in FY 2004, working as the bookstore manager, helping with special events, fire traffic control and whatever else needs to be done.

We should also mention a special team of volunteers, Robert and Mary Swan, who were the outstanding new volunteers in FY 2003 and were honorable mention in a very close three way race for volunteer of the year. Together they have recruited and led small groups doing many different upland restoration projects. Robert and Mary have donated over 1,350 combined hours working in the bookstore, planting, cleaning and collecting prairie seeds, cleaning conetainers, and are in charge of the Refuge's recycling program (photo 69 and photo 70).

Thanks to all the volunteers whose added hours equaled 11 full time employees!

Friends of the Prairie Learning Center - 2004 Annual Report

The Friends' membership continues to average 250 paid members. Although most of the members are from Iowa, twenty states are represented in the membership.

The Friends main means of communication with members is the Prairie Wind Newsletter, which is produced quarterly. Besides the newsletter, an e-mail message, Gentle Breezes, is usually sent monthly, detailing the planned "Second Saturday" stewardship activities and any Friends or Refuge general announcements or news releases of up-coming Refuge events.

The Friends' website, *tallgrass.org*, continues to be a main contact point with the public. The site generates on the average one new member a month, and is the primary communication means in between newsletters. The monthly usage of the site is tracked. October is the highest site activity month with on the average, 363 page views per day, 3,071 unique visitors and 500 visitors that visited more than once.

The Friends continue to fund the Refuge's major public events:

- Earth Day with 176 people participating in cleaning seed, clearing trees and brush, trash removal from dump sites and the roadways, and fence removal. This year, Congressman Leonard Boswell planted some seedlings and addressed the volunteers during a lunch break to thank them for all their hard work.

- International Migratory Bird Day combined with a two day Wildlife Art Show and Sale.

- Buffalo Day with over 700 people visiting the Refuge enjoying prairie & Native American music, stories, talks and crafts.

- "Ding" Darling Day with 185 volunteers taking part in stewardship activities.

Contact and coordination with other Friends groups both in Region 3 and nationally continue to develop and expand. A Friends representative was sent to the National Wildlife Refuge Association's "Legislative Boot Camp" in Washington D.C. After attending various training programs, she visited Senator Harkin's and Congressmen Boswell's office.

A representative from the Friends group, along with twenty-two Friends group representatives from around the country, attended the Conservation in Action Summit. The Summit was held to plan the next five to fifteen years of growth for the refuge system and provided an invaluable public voice in the planning process. Past president, Tom Prall, represented the Friends and worked in breakout sessions to address needs in four categories: science, wildlife-dependent recreation, wildlife and habitat, and strategic growth. Specific action items were prioritized at the end of the summit. This was an opportunity to help guide the future of the refuge system at the national level.

The Friends of the Prairie Learning Center continue their membership in the National Wildlife Refuge Association's Friends Affiliate Program. The program joins together the 240 Friends groups into a common voice to support the refuge system. The NWRA organization is dedicated exclusively to protecting, enhancing and expanding the National Wildlife Refuge System.

One of the major projects, started in 2004, was establishing a prairie restoration and environmental education research library. The library will consist of books, periodicals, videos, research reports, and educational trunks. Besides providing funds for supplies, the Prairie Point Bookstore provided the library a copy of every book in stock, over 500 books. Phase II of the project will be started in 2005. This phase consist of organizing the thousands of photos in a data base.

Partnering with the Refuge, the Friends received a Nature of Learning Grant provided by the National Geographic Society. With this grant, a digital camera and a Trimble GPS unit were purchased for the Refuge. This unit is used in the environmental education programs with select public schools to monitor a section of the reconstructed prairie, analyzing their effort and passing the program and data to the next year's class.

The Friends sponsored four internships in 2004, two public use and two biology interns for a nine week program (photo 71).

The Prairie Point Bookstore team continues to develop and expand the inventory of the bookstore. An inventory control system was developed using the computer-based cash register program.

The J. N. "Ding" Darling Foundation will provide a $20,000 grant to the Friends conditional on them raising a matching $20,000. The income from the grant and match will provide a fund to sponsor an intern to the Refuge every year. The board will work on a fund raising program to achieve the matching $20,000.

Photo 61 – Staff Photo
Front Row (L to R) – J Below, S Ford, and A Murray
Row 2 – D Van Ryswyk, P Drobney, S Hollerich, N Gilbertson, and R Hager
Row 3 – J Krueger, G Stapleton, B Boot, T Severson, M Rich, G Shea and C Dykstra

Photo 62 – YCC crew on boardwalk constructed on Basswood Trail

Photo 63 – Staff remove topsoil in preparation for butterfly garden

Photo 64 – YCC enrollees prepare site for bricks

Photo 65 – Rick Hager showed YCC crew how to install bricks

Photo 66 – Now all we need are the plants and the butterflies!

Photo 67 – Volunteers staff the Prairie Point Bookstore seven days a week

Photo 68 – Volunteers also greet visitors at the Front Desk

Photo 69 – Volunteers were awarded gift certificates for each donating over 1,000 hours

Photo 70 – Over one hundred people participated in the Volunteer Banquet

Photo 71 – Biology Interns Jessica Babcock and Ray Schmidt